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HORTICULTURAL ABSTRACTS

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EDITORIAL NOTES

CHANGES IN H.A.

Readers with a specialist interest in weeds and herbicides will notice that the section headed "Weeds and weed control" has disappeared. When, some years ago, the selective herbicide first hit the headlines, a good case could be made out for creating a separate section in *H.A.* to cover the abundant literature on weed control that sprang up overnight. Since then this literature has become no less abundant and certainly no less complex, but the subject as such has lost its aura of mystery and exclusiveness. In fact, it could be said that weed control is back where it used to be before the chemists became interested in it, namely as one of the essential routine processes involved in growing a crop.

This fact is now recognized, albeit belatedly, in the re-arrangement of weed control abstracts in this number of *H.A.* The coverage of weed literature remains unchanged, but most of the abstracts will be found, with others devoted to cultural problems, under the crops concerned. A few papers of a more general nature have found a home in the section so conveniently headed "Miscellaneous".

It is believed that the new arrangement will be generally acceptable to agronomists and pomologists. The only people who will probably regret the change are weed control specialists, but these specialists are already well served by an abstract journal devoted to their subject, namely, Weed Abstracts, published by the Agricultural Research Council, Unit of Experimental Agronomy, Department of Agriculture, University of Oxford.

NOTES OR BIBLIOGRAPHIES AVAILABLE

Information, in stencilled form, is available on the 33 subjects listed below. Copies of these have already been sent to the original enquirer, and one copy can now be sent gratis to any one address so long as the supply lasts.

Please write direct to us (NOT to C.A.B., Farnham Royal) and merely quote the Query File No.

Query File No.	*Subject*	*Information given*
3618	Notes and bibliography on the **Use of growth substances to induce fruit set on grape vines**	3 pages notes + 37 references
3627	Annotated bibliography on **Glasshouse cooling**	12 references
3629	Bibliography on ***Psidium*** **(with particular reference to *P. guajava*)**	186 references
3662	Annotated bibliography on the **Apple variety Ingrid Marie**	16 references
3664	Annotated bibliography on the **Effect of climatic factors and various treatments on plant composition**	20 references
3678	Annotated bibliography on the **Use of anti-transpirant dips or sprays to reduce water losses in the transplanting of trees and shrubs**	15 references
3680	Notes and bibliography on **Hollowness or puffiness in tomatoes**	1 page notes + 9 references
3683	Bibliography on the **Bulk harvesting of apples**	16 references supplementing those given in Digest No. 1.
3686	Annotated bibliography on **Sugar cane trash yields and methods of disposal**	30 references
3687	Annotated bibliography on **Tropical plant sources of pectins**	27 references
3692	Abstract bibliography on the **Nutrition of pears**	96 references
3707	Annotated bibliography on the **Propagation of *Magnolia grandiflora* by cuttings**	6 references
3724	Bibliography on **Ramie**	66 references
3726	Standard reference books on **Tropical crops**	89 references

Query File No.	*Subject*	*Information given*
3728	Annotated bibliography on the **Foliar application of potassium fertilizers to horticultural and plantation crops**	32 references
3731	Annotated bibliography on **Nutrients for orchid culture with special reference to seed germination**	10 references
3733	Bibliography on **Citrus essential oils**	52 references
3742	Annotated bibliography on **Latex yield stimulation in *Hevea brasiliensis* by growth substances and minor elements**	33 references
3752	Notes and bibliography on **Methods of improving colour in dessert apples with chemicals (other than fertilizers) and with light**	2 pages notes + 52 references
3753	Notes and bibliography on **Air pollution by industrial gases—its detection by indicator plants and other means**	2½ pages notes + 35 references
3754	Annotated bibliography on the **Storage of onion and shallot bulbs and sets**	104 references
3760	Annotated bibliography on **Growth correlations between young and older perennial plants**	12 references
3775	Annotated bibliography on the **Major element (N, P, K, Ca and Mg) composition of beans and peas**	81 references, mainly covering 1955-1960
3776	Annotated bibliography on the **Green petal virus disease of strawberries**	26 references
3796	Bibliography on **Costs of production of cacao**	24 references
3804	Annotated bibliography of recent work on the **Propagation and culture of Wedgwood iris bulbs**	53 references
3809	Notes and bibliography on **Bolting in beetroot**	½ page notes + 10 references
3825	Notes and references on the **Cold storage or cold treatment of seeds following stratification**	½ page notes + 4 references
3825a	Annotated bibliography on the **Storage of seeds at low temperatures**	25 references
3831	Bibliography on **Reversion and big-bud in blackcurrants**	32 references
3832	Bibliography on **Packing and storage of pineapples**	16 references
3854	Notes and bibliography on the **Calcium nutrition of celery and celeriac**	20 references
3863	Books on **Pruning**	19 references

MISCELLANEOUS.

General.

1. Folley, R. R. W.
Commercial horticulture in Great Britain: its character and competitive strength.
[*Publ.*] *Wye Coll. Dep. agric. Econ.*, 1960, pp. 77, bibl. 24, 7s. 6d.

part I the economic features and size of comercial horticulture in Great Britain are described. part II an analysis is made of the probable effects the closer association with certain countries in estern Europe on various classes of horticultural oduction. These effects are likely to be a decline the gross output of coarse vegetables, reduced turns from the growing of dessert top fruit and reduction in the size of the present glasshouse dustry. The future policy, outlined in part III, ould aim at the amalgamation of too small and efficient holdings and at improvements in the arketing organization.

2. Hinton, W. L.
Distribution of horticultural output in England and Wales.
Agriculture, Lond., 1960, **67**: 184-8.

he pattern, value and intensity of production of getable, fruit, flower and glasshouse crops.

3. (Hodent, —.).
Horticulture saharienne. (**Saharan horticulture.**)
Rev. hort. Algér., 1959, **63**(10-12): 26-7.

he 90-odd genera successfully cultivated at the ommunal Gardens at Ouargla include the llowing types of plant (with random examples): wn plants (oxalis), border plants (narcissus, vender), flowers (cosmos, poppy, geranium), rubs (aloe, buddleia, rose, grenadine), trees mulberry, eucalyptus, poplar).

4. Mysore Department of Horticulture.
Mysore horticulture illustrated.
[*Publ.*] *Govt Mysore*, Bangalore, 1959, pp. 72, illus.
Marigowda, M. H.
Horticulture in Mysore.
Reprint from *Simhavani Suppl. World Agric. Fair*, 1960, pp. 15, illus.

opular accounts of the work of the Mysore epartment of Horticulture with the celebrated albagh Botanical Gardens as its nucleus.

5. Harant, H., and Delange, Y.
Le jardin des plantes de Montpellier. (**The Montpellier botanical garden.**)
Rev. hort. Paris, 1960, **132**: 2269-71, illus.

6. Lapin, P. I.
The main botanic garden of the U.S.S.R. Academy of Sciences, Moscow: its building and scientific research work.
J. roy. hort. Soc., 1960, **85**: 251-7, illus.

Including data on natural conditions of the Moscow region. [See also *H.A.*, 30: 4641.]

7. Mappes, F.
Staatliche Lehr- und Forschungsanstalt für Gartenbau in Weihenstephan. (**The state teaching and research institute for horticulture at Weihenstephan, Freising, Munich.**)
Gartenwelt, 1960, **60**: 286-8, illus.

A short account is given of the work of the different sections of this well-known Bavarian station, including those dealing with fruit, vegetables, ornamentals and horticultural engineering.

8. Lafferty, D. G.
Production patterns, marketing practices, and problems of Arkansas fruit and vegetable producers.
Bull. Ark. agric. Exp. Stat. **626**, 1960, pp. 39.

The major crops dealt with are strawberries, peaches, tomatoes, watermelons, beans and spinach.

Climate and air pollution.

(*See also* 252, 253, 427, 1119, 1259, 1653.)

9. Strekova, V. Ju.
Protoplasm viscosity in leaves of some thermophilic plants rendered cold-resistant by treatment at alternating temperatures. [Russian, with English summary 10 lines.]
Fiziol. Rast., 1960, **7**: 428-34, bibl. 24.

The hardening of tomato seeds by alternating high and low temperatures affected the properties of the protoplasm, in particular the viscosity. During early development seedlings from hardened seeds had a higher or lower protoplasmic viscosity than the controls, but cooling produced a more intensive reaction in the hardened plants, the viscosity falling more rapidly during brief cooling and rising to the critical level more slowly during prolonged cooling. These differences in the properties of the protoplasm are considered responsible for the better adaptation of hardened plants to sudden changes in temperature.

10. Kardo-Sysoeva, E. K., and Pahomova, M. V.
On the nature of frost resistance in plants. [Russian, with English summary ½ p.]
Fiziol. Rast., 1960, **7**: 423-7, bibl. 15, illus.

In plants capable of recovering from frost injury, such as cabbage, new chloroplasts were formed from the remains of the old plastids within 3-5 minutes of thawing. In less frost-resistant plants the formation of new chloroplasts started after 40-50 minutes, and in susceptible plants no new chloroplasts were formed and the plants died. The formation of new chloroplasts was accompanied by protein synthesis and the disappearance of starch.

11. Mercier, R. G.
Protection against frost in southern Ontario.
Publ. Ont. Dep. Agric. **26**, 1960, pp. 7, illus.

Methods briefly discussed for growers.

12. Shepherd, F. W.
Wind and problems of shelter.
Gdnrs' Chron., 1960, **147**: 496-7.

Types of damage and the best sheltering materials discussed. [See also *H.A.*, 30: 4661.]

13. Garber, K.
Neuere Literatur über Rauch-, Staub- und Abgasschäden. (**New references to the literature on air pollution damage.**)
Angew. Bot., 1960, **34**: 65-103, bibl. 331.

A short review, followed by a large bibliography.

14. Spierings, F.
Invloed van luchtverontreiniging op land- en tuinbouwgewassen in de nabijheid van enkele industriecentra in Nederland. (**The influence of air pollution on agricultural and horticultural crops in some industrial areas in the Netherlands.**) [English summary 1½ pp.]
Meded. Inst. PlZiekt. Onderz. Wageningen **217,** [undated, received 1960], pp. 58, bibl. 8, illus.

Observations on HF and SO_2 air pollution injury made in three main industrial areas are described. By means of test plants the extent of the damage could be determined; leaf analyses of injured plants were also made. Gladioli, tulips, freesias and some other crop plants were tested for their response to the harmful gases in fumigation chambers.

15. Taylor, O. C., and others.
Effect of air-borne oxidants on leaves of pinto bean and petunia.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 435-44, bibl. 10, illus.

A comparison was made of the symptoms of leaf injury caused by various types of oxidant in polluted air. *Ozone:* Long exposure to dosages of less than 0·2 p.p.m. caused chlorosis of the older petunia leaves, and exposure to dosages above 0·25 p.p.m. caused mesophyll collapse. On pinto beans even low dosages (0·1 p.p.m.) caused mesophyll collapse of 14-day-old leaves and to a lesser extent of 7-day-old leaves. *Reaction products of ozone and l-hexene* caused no visible injury on petunia leaves, but caused glazing on the under surface and mesophyll collapse on 14-day-old pinto bean leaves. *Irradiated mixtures of nitrogen dioxide and l-hexene* caused (a) banding and lower surface glazing of young, expanding petunia leaves, (b) bronzing and glazing of the lower surface of 7-day-old primary and trifoliate pinto bean leaves, and (c) no injury to 14-day-old pinto bean leaves. *Oxidants in polluted ambient air* caused ozone and ozone-hexene types of injury on pinto bean plants, but the injury most prevalent on the bean and petunia plants appeared to be identical with that caused by the irradiated mixtures.—Univ. Calif. Citrus Exp. Stat., Riverside.

16. Gorham, E., and Gordon, A. G.
Some effects of smelter pollution northeast of Falconbridge, Ontario.
Canad. J. Bot., 1960, **38**: 307-12, bibl. 6.

A study along a line NNE from the metal smelter at Falconbridge, Ontario, reveals that strong sulphate accumulation in the surface soil occurs only within about one mile of the chimneys emitting sulphur dioxide pollution, while effects upon the soil drainage waters are marked to a distance of nearly 2 miles, and still clearly evident 10 or more miles away. The number of species present in the flora declines sharply within about 4 miles of the smelter, but certain species (e.g. *Pinus strobus*, *Vaccinium myrtilloides*) disappear at much greater distances. Among the most tolerant species are *Acer rubrum*, *Quercus rubra*, *Sambucus pubens* and *Polygonum cilinode.* [Authors' abstract.]—Univ. Toronto, and Ont. Dep. Lands and Forests.

Seeds.

(*See also* 80, 96, 242-248, 420, 590-592, 706, 727-731, 751, 867, 1082, 1238, 1239, 1368.)

17. Clark, B. E., and Page, H. L.
The quality and labeling of seeds in New York as revealed by sampling and testing in 1959.
Bull. N.Y. St. agric. Exp. Stat. **788**, 1960, pp. 42, illus.

18. Bacchi, O.
Equilíbrio higroscópico das sementes de café, fumo e várias hortaliças. (**The hygroscopic equilibrium of seeds of coffee, tobacco and various vegetables.**) [English summary 9 lines.]
Bragantia, 1959, **18**: 225-32, bibl. 5.

The seeds used in this study were those of coffee, tobacco, lettuce, eggplant, onion, cauliflower, runner bean, watermelon, okra, cabbage and tomato. They were kept at constant R.H. values ranging from 10% to 90% until they ceased to change in weight, after which their initial and final water contents were compared. The results are shown in tables and graphs. The R.H. value at which the initial water content was maintained was between 70 and 80% for coffee, between 60 and 70% for tobacco and cabbage, and between 50 and 60% for the other types of seed tested. The high moisture contents of all types at 90% R.H. were attributed to decreases in dry matter in the seeds.

19. Pellizzi, G.
Macchine nella produzione e per l'impiego delle sementi. **(Machines used in the production and handling of seeds.)**
Sementi elette, 1960, **6**(1): 53-5, (2): 57-9, illus.

e elevators described are of 3 types: (1) with a ries of cups, (2) with a vibrating spiral channel, and) with moving shelves for raising bags of seed. e transporters are (1) a spiral chute, (2) a moving bber belt, and (3) mobile models with "escalator" ts, or chains with detachable troughs. [For scriptions of seed drying and counting machines, e *H.A.*, 30: 1503.]

20. Kleňha, J.
Ein Beitrag zur Prüfung der Keimungsfähigkeit einiger Pflanzensamen. **(Testing the germination capacity of some plant seeds.)**
Naturwissenschaften, 1960, **47**: 382, bibl. 7.

ith α-naphthylamine, which is cheaper than trazolium salts.

21. Ritslaid, V.
Aeroionisatsiooni mõjust seemnete idanemisele ja taimede kasvule. **(The effect of ionized air on seed germination and plant growth.)** [Russian and German summaries 1½ pp. each.]
Toim. Tead. Akad. Eesti NSV, biol. Ser., 1960, **9**: 167-79, bibl. 5, illus.

he growth of *Euonymus europaea* seedlings was creased in the first season by 23-56%, and in the cond by 49-138%, when the seeds were treated ith ionized air daily for 5-20 minutes from November to 16 December. A similar treatment pplied to seeds in March did not improve growth, ut treatment of the seedlings in June resulted in 26·7% increase in height. The length of the dicles in germinating radish seeds was reduced y 13% when the seed was given 4 treatments, but as increased by 33% when it was treated only nce. Single seed treatments of 20 minutes' uration also increased seedling growth in the ttuce variety Kraus Prima by 122% and in erliner by 25%, but in the variety May no ifferences were noted between seedlings from eated and untreated seeds.—Tartu St. Univ.

22. Picci, G.
Dosaggio microbiologico di alcune vitamine e di alcuni aminoacidi ceduti dal seme durante la germinazione. **(Microbiological determination of certain vitamins and amino acids leached from seeds during germination.)**
Ann. Fac. Agrar. Univ. Pisa, 1959, **20**: 51-60, bibl. 8.

he amounts of 7 vitamins of the B complex and amino acids leached from seeds by soaking in istilled water were determined for various kinds f seeds, including turnip and mustard. The bearing of the results on the problem of "seed effect" on the soil microflora is discussed.

23. Verona, P. L.
Influenza dell' "effetto-seme" sull' attività saccarasica del terreno. **(The influence of the seed-effect on the saccharase activity of the soil.)**
Atti Ist. bot. Univ. Pavia, 1960, **17**: 184-7, bibl. 5.

The presence of germinating seeds, including those of lupins, significantly increased the saccharase activity of the 3 soils tested. The effect was least marked in the most sandy soil.

Soils and composts.

(*See also* 1113.)

24. Strydom, J. C.
Valuable information on peatmoss—and its uses.
Fmg S. Afr., 1960, **36**(1): 47-8.

Types and their uses and limitations in ornamental horticulture.

25. Jungk, A.
Über die Umsetzung von Malzkeimen in Torf. **(On the decomposition of malt germs in peat.)**
Gartenwelt, 1960, **60**: 166-7, bibl. 2.

The liberation of N and effect on pH of media used for azaleas, etc. [See also *H.A.*, 30: 3113.]

26. Börner, H.
Liberation of organic substances from higher plants and their role in the soil sickness problem.
Bot. Rev., 1960, **26**: 393-424, bibl. 182.

A review of the literature on root excretions and the liberation of substances from seeds, fruit, leaves and plant remains.

Water and irrigation.

27. Australian Institute of Agricultural Science (W.A.) and Farmers' Union of W.A.
Water in agriculture.
[*Proc.*] *Farmers' and Scientists' 1959 Joint Conference*, pp. 63, illus.

Papers read at the conference deal with rain making, irrigation, problems of soil salinity, and plant growth and water relations, all essentially from the agricultural point of view.

28. Molenaar, A.
Irrigation by sprinkling.
Agric. Devel. Pap. FAO **65**, Rome, 1960, pp. 93, bibl. 10, illus.

A practical manual covering design, operation and maintenance of sprinkler systems for irrigation, application of fertilizers and frost protection.

29. Produktivitetsudvalget for Gartneri og Frugtavl, Copenhagen.
Afprøvning af vandingsmateriel. 1. Dyser til drivhusvanding og tågeanlaeg. **(Testing irrigation equipment. 1. Nozzles for glasshouse irrigation and for mist [propagation] systems.)**
[*Publ.*] *ProduktUdvalg. Gartneri Frugtavl*, Copenhagen, 1957, pp. 46, illus.

Eleven nozzles for glasshouse irrigation and 3 misting nozzles are described, and their performance is discussed.

30. Christensen, S. A.
Afprøvning af vandingsmateriel. 3A. Afprøvning af drypvanding. **(Testing irrigation equipment. 3A. Testing trickle irrigation.)**
[*Publ.*] *ProduktUdvalg. Gartneri Frugtavl*, Copenhagen, 1958, pp. 32, illus.

Preliminary trials to study the value of trickle irrigation for glasshouse tomatoes and cucumbers.

31. Uljee, A. H.
New, easy-to-construct simpler trickle irrigation system.
N.Z. Comm. Gr, 1960, **15**(11): 8-9, illus.

The diluter for introducing fertilizers, etc., into the irrigation system is described in detail.

32. Rognerud, B.
Målemetoder for tilgjengeligheten av vatn i jorda og litt om den betydning dette har for vatning i praksis. **(Methods of measuring soil water availability and the importance of such measurements in irrigation practice.)**
Frukt og Baer, 1960, **13**: 52-60, bibl. 11, illus.

A review.

33. Soane, B. D.
Construction and use of a cheap tensiometer for research workers.
Rhod. agric. J., 1960, **57**: 244-50, bibl. 10, illus.

Constructed from readily obtainable local materials, except the ceramic cup.

34. Janes, B. E.
Predicting need for irrigation by measuring loss of water from atmometers.
Progr. Rep. Conn. agric. Exp. Stat. **42**, 1960, pp. 6, bibl. 11.

A procedure is described for predicting the amount of water the soil will lose through transpiration from the plant and evaporation from the soil surface by measuring the amount of solar energy received at plant height. Experiments have shown that the difference between the water loss from black and from white atmometers is directly proportional to the amount of sunshine. The following formula has been developed to estimate potential evapotranspiration by measuring the difference in water loss from black and white atmometers: $P.E. = \cdot 0229 + \cdot 0126\,(B - W)$.

35. Hudson, J. P.
A sensitive evapo-transpiration gauge.
Bull. Res. Coun. Israel, Sect. D, 1960, **8D**: 263-72, bibl. 7, illus.

Equipment is described for the separate assessment of (a) transpiration per unit area of crop and (b) evaporation from the soil surface, from crops grown at commercial spacings and under normal methods of management. The equipment is based on the application of measured amounts of water to each unit area of soil through slow-running nozzles; assessment of gain or loss of water from the rooting zone by measuring soil moisture tension; and the measurement of drainage water, which is caught in shallow trays buried deeply in the soil below the rooting zone. The equipment allows free run of roots, thus avoiding the edge effects of normal enclosed lysimeters. Results for tomatoes grown in a heated glasshouse in two gauges, each 210 × 180 cm. in area, surrounded by several guard rows on 3 sides and exposed to a concrete path on the fourth, showed (a) a very high correlation between daily water use per plant and evaporation as measured by evaporimeters, (b) differences of nearly 4 times in water use between one day and another, depending on the weather, (c) transpiration at the rate of nearly 9 mm. water per day in hot sunny weather, and (d) water consumption by plants in the guard rows at a rate more than double that of plants within the cropping area. [From author's abstract.]—Univ. Nottingham.

36. Pelton, W. L., King, K. M., and Tanner, C. B.
An evaluation of the Thornthwaite and mean temperature methods for determining potential evapotranspiration.
Agron. J., 1960, **52**: 387-95, bibl. 21.

Mean temperature methods can be used with limited success for long-period (growing season and annual) estimates of potential evapotranspiration, but energy balance methods are preferable if radiation data are available. [From authors' summary.]—Univ. Wis., Madison.

37. Levitt, J., Sullivan, C. Y., and Krull, E.
Some problems in drought resistance.
Bull. Res. Coun. Israel, Sect. D, 1960, **8D**: 173-80, bibl. 5, illus.

A classification of plants adapted to dry climates is presented. The term drought resistance covers both drought avoidance (the ability to prevent reduction in water content) and drought tolerance (the ability to survive reduction in water content). In all the plants tested (cereals and cabbage) drought resistance was always shown to be due to drought avoidance except in cases where frost hardening was found to increase drought resistance; in such ses true drought tolerance was established. A ethod is described for determining whether ought resistance in a plant is due to avoidance to tolerance and what physiological factors are volved. A simple chamber for measuring drought sistance is described. [See also *H.A.*, 29: 3076.] Univ. Mo, Columbia.

38. Slatyer, R. O.

Aspects of the tissue water relationships of an important arid zone species (*Acacia aneura* F. Muell.) in comparison with two mesophytes.

Bull. Res. Coun. Israel, Sect. D, 1960, **8D**: 159-68, bibl. 12.

ssue water relationships of *Acacia aneura* in terms relative turgidity, diffusion pressure deficit DPD) and osmotic pressure were compared with ose for two mesophytic species, tomato and ivet. *A. aneura* was shown to be much more sistant to desiccation than the other two species. *A. aneura* a DPD of 15 atm. reduced the lative turgidity to only 92%, whereas the same gree of water stress reduced the relative turgidity tomato to 73% and that of privet to 87%. In der to reduce the relative turgidity to 50% a PD of nearly 60 atm. was required for *A. aneura*, atm. for tomato and 38 atm. for privet. *A. eura* tissue recovered from a DPD of approxi- ately 130 atm. without injury, while DPD's of 5 and 90 atm. proved lethal to tomato and privet spectively. A feature of the DPD developed in *aneura* was that it could only partially be plained by increasing osmotic pressure, whereas the other species the DPD was satisfactorily plained on this basis. [Author's abstract.]— S.I.R.O., Canberra.

39. Vasil'eva, N. G., and Burkina, Z. S.

Water conditions in cell components. [Russian, with English summary 10 lines.]

Fiziol. Rast., 1960, **7**: 401-6, bibl. 14.

study was made of the distribution of H_2O^{18} in fferent parts of the cells of french and broad bean aves. In the chloroplast and protoplasm sap actions the O^{18} concentration was found to be maller than in the vacuole sap, indicating a greater ater reserve than in the vacuole sap in which the ater exchange appeared to be the most rapid.— .S.S.R. Acad. Sci., Moscow.

40. Vartapetjan, B. B.

Further studies on the exchange of water in plants with the aid of heavy water. [Russian, with English summary 10 lines.]

Fiziol. Rast., 1960, **7**: 395-7, bibl. 2.

Vhen both attached and detached roots of 12–13- ay-old bean plants were placed in a nutrient olution containing H_2O^{18}, one-half of the xchangeable water in the roots was replaced by xternal water in 1 minute. After retaining the lants in the H_2O^{18} solution for 75 hours the concentration of H_2O^{18} in the roots and leaves was only 70–80% of that in the solution, whereas in the stem tissue it was almost equal to it. [See also *H.A.*, 29: 3143.]—U.S.S.R. Acad. Sci., Moscow.

41. Slatyer, R. O.

Absorption of water by plants.

Bot. Rev., 1960, **26**: 331-92, bibl. pp. 15.

A critical review of the literature.

Nutrition.

(*See also* 180.)

42. Widdowson, F. V.

Fertilizer placement.

N.A.A.S. quart. Rev., 1960, No. 48, pp. 147-50, bibl. 23.

A brief review mainly of Rothamsted work on field and horticultural crops.

43. Mellado Brauns, L.

Aplicación de isótopos radiactivos a la investigación de suelos, fertilizantes y nutrición vegetal. (**The application of radioactive isotopes to research on soils, fertilizers and plant nutrition.**) [English summary ¼ p.]

Bol. Inst. nac. Invest. agron. Madrid, 1960, **20**: 161-83, bibl. 33, illus.

Mainly a review, covering various crops.

44. Cook, R. L., and Millar, C. E.

Plant nutrient deficiencies diagnosed by plant symptoms, tissue tests, soil tests.

Spec. Bull. Mich. agric. Exp. Stat. **353**, revised 1953, pp. 84, bibl. 19, illus., [received 1960].

Notes are given on symptoms of deficiency of N, P, K, Mn, B, Mg, Ca and Fe in cereals, legumes, roots, fruit and leaf vegetables and flowers; and on green-tissue tests and how to make them with the Spurway Simplex soil-testing kit. There is a series of coloured plates depicting various nutrient deficiencies in a number of plants.

45. Stevenson, G.

Fixation of nitrogen by non-nodulated seed plants.

Ann. Bot. Lond., 1959, **23**: 622-35, bibl. 51.

When plants of several species, including radish, *Coprosma robusta* and *Leptospermum scoparium*, were grown in N-free sand cultures for 4–14 months, all plants showed gains in total N at the end of the experiment; *Azotobacter* and *Clostridium* were absent from the medium. In other experiments cut shoots of apricot standing in a minus-N culture solution were found to accumulate N when placed in an atmosphere enriched with N^{15}.

46. Bond, G.

Inhibition of nitrogen fixation in non-legume root nodules by hydrogen and carbon monoxide.

J. exp. Bot., 1960, **11**: 91-7, bibl. 22.

In detached nodules of *Casuarina*, *Alnus* and

Myrica, to a similar degree as that found in pea and soya bean nodules.

47. TUEVA, O. F.
A study of the relationship between phosphorus metabolism, plant productivity and the conditions of nitrogen nutrition, using P^{32}. [Russian, with English summary $\frac{1}{3}$ p.]
Fiziol. Rast., 1960, **7**: 3-12, bibl. 9.

The most important factor in the effect of nitrogen metabolism on the uptake and utilization of P by plants, including pumpkin, was found to be the relative increase in the amount of soluble N compounds which takes place in the roots during development. Conversely, the P supply influenced the character of N metabolism. In the presence of excess N plants did not fully utilize the available P. Most of the phosphatides were synthesized in the leaves, and most of the nucleoproteins in the roots.

48. KURSANOV, A. L., AND VYSKREBENCEVA, E. I.
Primary participation of phosphates in root metabolism. [Russian, with English summary $\frac{1}{2}$ p.]
Fiziol. Rast., 1960, **7**: 276-86, bibl. 19.

In the roots of 25-day-old pumpkin plants 30% of P^{32} was found in organic combination $\frac{1}{2}$–1 min. after the application of Na $H_2P^{32}O_4$ and 70% after 3–5 min. The first compounds into which the absorbed P entered were nucleotides, such as ATP, followed by sugars. The incorporation of P into phosphoproteins and nucleic acids was less rapid. The rate of metabolism in the roots was intensified by contact with mineral salts, but the formation of nucleotides was inhibited by 2,4-dinitrophenol and this inhibition was not counteracted by subsequent contact with mineral salts.

49. MCILRATH, W. J.
Boron and sugar translocation in plants.
Science, 1960, **132**: 898-9, bibl. 13.

A criticism of the article abstracted in *H.A.*, 30: 4713, and evidence on the role of boron.

50. WALLACE, A., AND LUNT, O. R.
Iron chlorosis in horticultural plants, a review.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 819-41, bibl. 148.

51. TIFFIN, L. O., BROWN, J. C., AND KRAUSS, R. W.
Differential absorption of metal chelate components by plant roots.
Plant Physiol., 1960, **35**: 362-7, bibl. 16, illus.

Various plants were grown in a medium to which the iron chelate Fe EDDHA was added. The plants were decapitated and analyses of the exudates showed selective absorption of Fe, the EDDHA remaining largely in the nutrient medium. —U.S.D.A., Beltsville, Md, and Univ. Md, College Park.

52. CHAPMAN, H. D.
The diagnosis and control of zinc deficiency and excess.
Bull. Res. Coun. Israel, Sect. D, 1960, **8D**: 105-30, bibl. 150, illus.

A comprehensive review of the literature.

Tissue culture.

(*See also* 708.)

53. LETHAM, D. S.
Growth requirements of pome-fruit tissues.
Nature, 1960, **188**: 425-6, bibl. 3, illus.

Details are given of the behaviour of explants of apple, pear and quince on various media. The basic medium was modified White's plus 2,4-D. The addition of either coconut milk or kinetin did not stimulate growth except in the presence of 2,4-D. Kinetin caused much greater stimulation if *l*-asparagine was also present. The experiments also included attempts to culture tissue from relatively older fruits, the use of other growth substances to replace the 2,4-D, and the culturing of other pome fruits.—D.S.I.R., Auckland, N.Z.

54. BERTOSSI, F.
Ritmo autonomo di crescita del tessuto di limone coltivato *in vitro.* **(Autonomous growth rhythm in lemon tissue grown *in vitro*.)**
Atti Ist. bot. Univ. Pavia, 1960, **17**: 210-21, bibl. 32.

A marked annual rhythm was found in the growth of explants from the stems of lemon seedlings. The annual "flush" period increased each year up to the 5th, after which the 12-hour day was changed for continuous lighting. The "flush" then became an extended, almost uninterrupted phase of proliferation, with a slight reduction of rate in the autumn.

55. SANDSTEDT, R., AND SKOOG, F.
Effects of amino acid components of yeast extract on the growth of tobacco tissue *in vitro*.
Physiol. Plant., 1960, **13**: 250-6, bibl. 13, illus.

Aspartic and glutamic acids promoted growth of tobacco stem callus tissue in culture solution as much as did a complete amino acid mixture. These 2 acids could be omitted singly from the mixture without serious loss in growth-promoting activity. The omission of isoleucine resulted in severe inhibition of growth only when valine was present. When methionine was omitted a less striking growth reduction resulted.—Univ. Wis., Madison.

56. DOUGALL, D. K., AND SHIMBAYASHI, K.
Factors affecting growth of tobacco callus tissue and its incorporation of tyrosine.
Plant Physiol., 1960, **35**: 396-404, bibl. 24.

Effects of IAA, kinetin, phosphate and tyrosine on the growth of callus tissue. Data on amino acid composition are given.

Physiology and metabolism.

(*See also* 91, 93, 375, 721, 726, 741, 772, 811, 812, 820, 887, 889, 955, 1118, 1126, 1643.)

57. Powell, R. D., and Griffith, M. M.
Some anatomical effects of kinetin and red light on disks of bean leaves.
Plant Physiol., 1960, **35**: 273-5, bibl. 6, illus.

he increased expansion caused by red light in iscs cut from etiolated bean leaves was not ccompanied by enlargement of the palisade cells, s was that caused by kinetin. When the 2 treatments were combined, the expansion was greater han with either treatment alone.—Univ. Fla.

58. Humphries, E. C., and Wheeler, A. W.
The effects of kinetin, gibberellic acid, and light on expansion and cell division in leaf disks of dwarf bean (*Phaseolus vulgaris*).
J. exp. Bot., 1960, **11**: 81-5, bibl. 19.

Kinetin increased leaf expansion wholly by increasing cell size. GA increased cell size, but it also increased cell division in the dark but not in the light. Light increased cell size and cell division; it eliminated the effect of GA on cell division but enhanced its effect on cell expansion. [From authors' summary.—See also *H.A.*, 29: 3146.]—Rothamsted exp. Stat., Harpenden.

59. Nelson, R. F.
An investigation of a chemical mechanism of foliar abscission.
Diss. Abstr., 1960, **20**: 4502, being *L.C. Card No. Mic.* 60-1566 of 81 pp.

Natural abscission in beans (*Phaseolus vulgaris* var. Top Crop) and cotton occurred 62 to 80 days after planting. Some debladed petioles abscissed 27 to 30 days after deblading, although others had not abscissed even after 40 days. There is evidence that leaf-blade removal also cuts off the supply of methyl groups (methionine). Injection of a 0·1 M solution of methionine induced abscission of debladed bean petioles after 6 to 13 days; choline induced abscission of cotton petioles. Potassium chloride, calcium chloride or calcium gluconate injected with methionine did not alter the rate of abscission; potassium chloride or calcium gluconate solutions alone induced abscission 6 to 19 days after injection. The role of methionine as a methyl donor in the abscission process was confirmed by using labelled methionine.—St. Univ. Ia.

60. Vendrig, J. C.
Plant en zwaartekracht. Een onderzoek over de invloed van de zwaartekracht op abscissieverschijnselen. (**Plant and gravity. A study on the effect of gravity on abscission processes.**) [English summary 7 lines.]
Meded. Dir. Tuinb., 1960, **23**: 365-73, bibl. 6, illus.

Petiole abscission on *Coleus* stems, which were only partially debladed, was accelerated by IAA at 1 g./l., and adventitious roots were formed sooner than on stems completely debladed. In both horizontally and vertically growing plants with the two top pairs of leaves removed IAA at 1 mg./l. delayed abscission, but at 0·01 mg./l. abscission was stimulated. Petioles on plants growing horizontally and rotated once every 2 minutes were slower to abscise than those on vertical plants. It is concluded that the rate of abscission is indirectly related to the metabolic activity on the stem side of the abscission zone, and to the amount of an abscission-inhibiting factor formed in the petioles and leaves in light.—Lab. Plant Physiol. Louvain.

61. Yager, R. E.
Possible role of pectic enzymes in abscission.
Plant Physiol., 1960, **35**: 157-62, bibl. 30, illus.

Pectin methylesterase (PME) activity has been found to be high in the abscission region of tobacco pedicels. Its activity is affected by IAA. High concentrations increase PME activity. Methionine decreases PME activity. IAA can overcome this inhibition of activity caused by methionine. It has been possible to duplicate the separation of cells observed normally as abscission occurs by incubating tissue from the abscission zone with various pectic enzymes. The conditions which affect abscission on the plant also affect the rates of cell separation caused by these enzyme preparations. Since IAA and methionine (which have been shown to affect abscission on intact plants) affect PME activity as well as rates of cellular separation caused by other pectic enzymes, it is possible that similar enzymes are active in the usual abscission reactions. Two possible roles of pectic enzymes in abscission are suggested. First, conditions which prevent PME activity may cause abscission by allowing for the accumulation of pectin which is soluble in water. Or secondly, other pectic enzymes may be involved in the production of pectin or by some other chemical pathway which ultimately causes the dissolution of the middle lamella. Various pectic enzymes were shown to cause this dissolution *in vitro*. [Author's summary.]—St. Univ., Iowa City.

62. Mothes, K.
Über das Altern der Blätter und die Möglichkeit ihrer Wiederverjüngung. (**On the ageing of leaves and the possibility of their rejuvenation.**)
Naturwissenschaften, 1960, **47**: 337-51, bibl. 35, illus.

The literature on the subject is reviewed in some detail. The author's own work shows that the ageing (yellowing) process of leaves can be reversed by the application of kinetin (6-furfuryl-aminopurine), which stimulates protein synthesis. *Nicotiana rustica* was used as the principal experimental plant. [See also abstract 888.]—Inst. Biochem. Pfl., Halle a.d. Saale.

63. Kisljakova, T. E.
Photosynthesis for 24 hours a day by plants in the Far North. [Russian, with English summary 9 lines.]
Fiziol. Rast., 1960, **7**: 62-6, bibl. 16.

When the light intensity was sufficient, photosynthesis persisted throughout the 24 hours of the day, under the polar conditions of the Kola peninsula, in wild plants such as blueberry as well as in cultivated plants including beans. Under conditions of low light intensity photosynthesis ceased, irrespective of the time of the day. The photosynthetic rate during the night was low, but began to increase around 4 a.m.

64. Wilkins, M. B.
Effects of light and darkness on the rhythm of output of carbon dioxide of excised *Bryophyllum* leaves.
Nature, 1960, **187**: 523-5, bibl. 3.

See *H.A.*, 30: 4705.

65. Butler, W. L.
A secondary photosynthetic carboxylation.
Plant Physiol., 1960, **35**: 233-7, bibl. 15.

In hydrangea leaves; markedly influenced by the duration of the preceding dark and light periods.

66. Heras, L.
Influence of light intensity on the redox potential in leaves in cases of iron-induced chlorosis.
Nature, 1960, **188**: 335-6, bibl. 4.

An attempt was made to find a relationship between the redox condition, the formation of the chlorophyll complex and its stability. Results suggest that to increase the chlorophyll content a certain redox level is required. When a change from low to high light intensity was made, decomposition of the chlorophyll continued as at low intensities. It appears that although the mechanism of chlorophyll formation is actually working in the chlorotic material its protective mechanism fails. Such protection is not due to polyphenols, as their formation occurs subsequent to that of chlorophyll. —Estac. exp. Aula Dei., Zaragoza, Spain.

67. Wolff, J. B., and Price, L.
The effect of sugars on chlorophyll biosynthesis in higher plants.
J. biol. Chem., 1960, **235**: 1603-8, bibl. 25.

When excised, etiolated bean leaves are starved by pre-incubation on water in the dark, they exhibit a lag in chlorophyll synthesis on exposure to red or blue light. This lag can be overcome by leaving a cotyledon attached to the leaves or by adding glucose or sucrose during the pre-treatment. The presence of sugar during the pre-incubation increases the subsequent endogenous respiration in the dark. Exposure of sugar-pre-treated leaves to red light during manometry further stimulates oxidation of endogenous, accumulated substrates in glucose-treated leaves, but not in those incubated with sucrose. Starved leaves irradiated during the assay oxidize added glucose more rapidly than sucrose. It is concluded that, although metabolites of glucose may be oxidized more rapidly than those of sucrose, both sugars are equally effective in supporting chlorophyll synthesis, since the rate-limiting step in pigment formation lies along the biosynthetic pathway. [Authors' summary.]—Smithsonian Inst., Washington, D.C.

68. Goodwin, T. W., and Phagpolngarm, S.
Studies in carotenogenesis. 28. The effect of illumination on carotenoid synthesis in french-bean (*Phaseolus vulgaris*) seedlings.
Biochem. J., 1960, **76**: 197-9, bibl. 13.

In the cotyledons of etiolated plants the main carotenoid pigments were β-carotene, lutein, chrysanthemaxanthin and auroxanthin, whereas in the etiolated leaves they were β-carotene, lutein and neoxanthin. Illumination of etiolated seedlings resulted in the synthesis in both the cotyledons and true leaves of the carotenoids associated with chloroplasts. [From authors' summary.]—Univ. Liverpool.

69. Klešnin, A. F., Šul'gin, I. A., and Verbolova, M. I.
On the optical properties of leaves. [Russian, with English summary 7 lines.]
Bot. Žurnal, 1960, **45**: 492-506, bibl. 12.

The light absorption of the leaves of plants (including many of horticultural interest) was found to differ more between the different ecological types, i.e. mesophytes, xerophytes, aquatics, etc., than between different species within the same ecological group. The lowest values occurred in mesophytes and aquatics. [See also *H.A.*, 30: 4707.]

70. Šul'gin, I. A., and others.
A study of the optical properties of leaves of woody plants with the aid of a Beckman spectrophotometer supplied with an integrating sphere. [Russian, with English summary ¼ p.]
Fiziol. Rast., 1960, **7**: 300-8, bibl. 15, illus.

The light-reflecting capacity of leaves of woody plants, including apple, in the spectral range of 440–680 mμ, was found to be greater than the light-transmitting capacity, indicating a xeromorphic structure of the leaves. Absorption was greatest, about 90%, in blue light (460–480 mμ) and red light (660–680 mμ), and smallest, about 75%, in yellow-green light (540–560 mμ). The percentage of absorption was lower in pubescent leaves than in smooth leaves because of their higher reflecting capacity.

71. Meijer, G.
The spectral dependence of flowering and elongation.
Acta bot. neerl., 1959, **8**: 189-246, bibl. 89.

periments with *Salvia occidentalis* (a short-day ant) and *Hyoscyamus niger* (a long-day plant) monstrated that at least two photoperiodic actions are involved in the process leading to a ng-day effect. The main-light-period reaction more sensitive to near infra-red and blue light an to red or green light. The effect of near ra-red and blue light can be antagonized by d light. The nightbreak reaction, promoted by d light, is nullified by a relatively short exposure near infra-red or blue light. Experiments with rious plant species on the elongation of inter-odes have shown that at relatively low intensities d light is more inhibitive than blue light. At latively high intensities blue light is the most hibiting spectral region. The inhibiting effect of d light on the elongation of hypocotyls of light-own gherkin seedlings is antagonized by a bsequent exposure to near infra-red or blue ght. The inhibiting effect of red light on the pocotyl of dark-grown gherkin seedlings is much ore pronounced when the seedlings are pre-radiated with white or blue light. [Author's stract. See also *H.A.*, 30: 1546.]—Philips Res. abs, Eindhoven.

72. Bünning, E., and Engelmann, W.
Endogen-tagesperiodische Schwankungen der photoperiodischen Hellrot-Empfindlichkeit bei *Kalanchoe blossfeldiana*. **(Endogenous diurnal fluctuations in the photoperiodical light-red sensitivity of *Kalanchoe blossfeldiana*.)**
Naturwissenschaften, 1960, **47**: 332, bibl. 1.

alanchoe blossfeldiana plants that had been kept permanent light were subjected to 8 cycles of 72 ours consisting of 10 hours of light and 62 hours f darkness. The dark periods were interrupted by minutes of light-red light (6,500–7,000 Å). Some f these interruptions of the dark period with red ght promoted flower opening, while others hibited it. These fluctuations in light sensitivity ere found to run parallel to the endogenous iurnal opening and closing rhythms of the owers. A more detailed report of the experiments to be published elsewhere.—Bot. Inst., Univ. übingen.

73. Resende, F.
On the transmission of the "floral state", through grafting, from LSDP-* or SDP-donors to LSDP-acceptors in LD and SD. Evidence for the separation of growth-hormones from anti-growth-hormones in this transmission.
Portugal. Acta biol., 1959, **6**: 1-17, bibl. 43, illus.

In each of 2 *Bryophyllum* hybrids under long-day conditions the complete floral state was transmitted from scions to vegetative stocks and extremely readily from stocks to vegetative scions in almost every instance. In a 3rd hybrid, however, not only did this transmission fail to occur, but where the stocks were the vegetative partners they reduced the flowering capacity of the scions. When the grafting was carried out under short-day conditions, however, complete transmission of the floral state resulted from only 10–20% of the grafts. Among 202 other grafts between flowering and vegetative portions of various species and hybrids of *Bryophyllum*, *Kalanchoe* and *Bryokalanchoe* in 35 different combinations, also under short-day conditions, only 3 showed induction of the true flowering state by transmission. In the whole series of tests (220 grafts including 37 combinations) there were instances of partial response; 9 floral portions caused their vegetative partners to develop the elongated internodes typical of the pre-floral state, and 3 floral stocks induced in the vegetative scions a type of branched rosette growth, with bracts instead of normal leaves. These partial responses are attributed to the passage of one or the other of the 2 interacting growth substances necessary for flowering.—Inst. bot., Lisbon.

74. Salisbury, F. B., and Bonner, J.
Inhibition of photoperiodic induction by 5-fluorouracil.
Plant Physiol., 1960, **35**: 173-7, bibl. 9.

From the results of a study on *Xanthium pennsylvanicum* the hypothesis is suggested that photoperiodic induction involves nucleotide metabolism, possibly nucleic acid synthesis.—Colo. St. Univ., Fort Collins, and Calif. Inst. Technol., Pasadena.

75. Schwemmle, B.
Unterschiedliche Schwankungen der Temperaturempfindlichkeit bei Lang- und Kurztagpflanzen (Versuche zur Blütenbildung). **(Differences in sensitivity to temperature between long- and short-day plants. Experiments on flower formation.)**
Naturwissenschaften, 1960, **47**: 68-9, bibl. 7.

With the qualitative long-day plant *Hyoscyamus niger* and the qualitative short-day plant *Chenopodium amaranticolor* grown under a 12-hr. photoperiod at 20° C. ± 0·5°, the regular exposure of the plants during the dark period to a cold treatment (5° C. ± 1°) of 3 hours had a specific effect on flowering. In the case of *H. niger* the time needed for the development of the flower stalk to begin after the initiation of the experiment was greatly increased if the cold treatment was applied from the 6th to the 9th hour of the dark period. Flower formation was thus markedly delayed, whereas low temperature applied at the beginning

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* L=long; S=short; D=day; P=plant

(0–3rd hour) or the end (9th–12th hour) of the dark period had the effect of hastening flowering slightly in comparison with the controls held at 20° C. continuously. With *C. amaranticolor*, on the other hand, flowering was delayed by cold treatment at the beginning or at the end of the dark period. In both cases differences in the length of time required for flowering were accompanied by differences in the number of foliage leaves formed before the appearance of the first flower and in the intensity of flowering. Exposure to 3 hours of high temperature (35° C.) at corresponding times during the dark period had the opposite effect to low temperature treatment. Thus it may be concluded that the two plants differ not only in their photoperiodic type but also in their daily rhythm of response to extreme temperatures.—PflPhysiol. Inst., Univ. Göttingen.

76. Schwemmle, B., and Meyer, K.
Tagesperiodische Änderungen des Temperatur-Reaktionsvermögens bei Keimpflanzen. (**Changes in the daily periodicity of temperature responses in seedlings.**)
Naturwissenschaften, 1960, **47**: 69-70, bibl. 7.

A preliminary note on the responses of 3 long-day and 3 short-day plants.

77. Venezian, M. E. S.
Nota preliminare su lo studio del metabolismo della pianta innestata con l'impiego di elementi radioattivi. (**A preliminary note on the study of the metabolism of grafted plants using radioactive elements.**) [English summary 6 lines.]
Ann. Sper. agrar., 1960, **14**: 429-36, bibl. 16.

After reviewing previous relevant work, much of the material concerned being fruit trees, the author describes her experiments in which she used radioactive phosphorus on grafted and ungrafted bean plants. Details of absorption and translocation in roots and leaves after 24 and 48 hours are tabulated. In general, both processes were slightly slowed down in grafted plants, especially in the xylem.—Inst. Fruttic. Elettrogenet., Roma.

78. Ohmura, T., and Howell, R. W.
Inhibitory effect of water on oxygen consumption by plant materials.
Plant Physiol., 1960, **35**: 184-8, bibl. 12.

Adding water to discs of carrot root tissue decreased oxygen uptake. Substitution of oxygen for air in the gas phase partially reversed the effect of added water. Oxygen uptake by discs previously washed in water was markedly lower than that by unwashed discs. It was increased by adding water, and still further increased by using oxygen in place of air.—Univ. Ill., and U.S. Dep. Agric., Urbana, Ill.

79. Barker, J.
High pressures of oxygen and respiration; an improved technique and a demonstration that high pressures as such may affect the rate of CO_2 output from plant tissues.
J. exp. Bot., 1960, **11**: 86-90, bibl. 4.

A technique is described which allows the metabolic rate of CO_2 output to be determined during the first 24 hours of treatment with oxygen at high pressures. With apples the rate of CO_2 output was inhibited by an increase of the absolute pressure to 3 atm., the partial pressure of oxygen remaining at 20% of 1 atm. The inhibition is attributed to mechanical distortion of the tissue caused by the increase in pressure. [From author's summary.]—Univ. Cambridge.

80. Birdsong, B. A., Alston, R., and Turner, B. L.
Distribution of canavanine in the family Leguminosae as related to phyletic groupings.
Canad. J. Bot., 1960, **38**: 499-505, bibl. 6.

Canavanine, an amino acid which appears to be concerned in the translocation and storage of nitrogen, has been found in the seeds of 68 leguminous plant species belonging to 32 genera. They include *Indigofera* spp., *Wisteria sinensis*, *Gliricidia sepium*, *Robinia* spp., *Glycyrrhiza glabra*, *Lonchocarpus* spp., *Vicia faba*, *Lathyrus* spp. and various plants commonly used as cover crops. It has not been found in members of certain subfamilies and tribes.—Univs. Texas and Rhode Island.

Growth substances.

(*See also* 58, 60, 61, 73, 222, 236, 242, 243, 249, 251, 290, 302, 303, 316, 318-324, 326, 327, 372, 373, 426, 433-441, 614, 653, 687, 703, 727-732, 765, 817-819, 884, 890, 895, 904, 954, 988, 999, 1000, 1017, 1042, 1044, 1114, 1130, 1160, 1170, 1178, 1184, 1256, 1344, 1349, 1499, 1529, 1610, 1611, 1628.)

81. Street, H. E.
Hormones and the control of root growth.
Nature, 1960, **188**: 272-4, bibl. 36.

A review, from which it is concluded that research is required on the isolation and identification of root hormones and on the enzymes responsible for their synthesis and metabolism.

82. Ghillini, C. A.
Allelopatie tra alghe e plantule di *Lupinus albus*. (**Allelopathy between algae and seedlings of *Lupinus albus*.**) [English summary ⅓ p.]
Atti Ist. bot. Univ. Pavia, 1960, **17**: 188-93, bibl. 12.

Filtrates from the cultures of 3 algae were applied to lupin seedlings. That from *Chlorella vulgaris* promoted growth, that from *Prototheca portoricensis* inhibited root growth, and *Spirogyra crassa* apparently produced no growth regulator.

83. Řeřábek, J.
Humic acid interactions in the growth process.
Biol. Plant., 1960, **2**: 88-97, bibl. 18.

Jsing wheat coleoptiles and flax hypocotyls, otassium humate, β-indoleacetic acid and α-aphthylacetic acid, the author was unable to iscover any auxin character in humic acid salts n water solution or any indication of anti-auxin ction.—Charles Univ., Prague.

84. Ruge, U.
Der Auxin-Gehalt von Tradescantia-Blättern in Abhängigkeit von der Wellenlänge des Lichtes. (**The auxin content of *Tradescantia* leaves in relation to the wave length of light.**)
Naturwissenschaften, 1960, **47**: 381-2, bibl. 3.

he most favourable conditions for the bioynthesis of auxin existed in the wave length range etween 505 and 580 nm.

85. Marrè, E., Forti, G., and Gaur, B. K.
Metabolic responses to auxin. V. Dissociation by carbon monoxide of effects of indoleacetic acid on growth and respiration.
Plant Physiol., 1960, **35**: 45-8, bibl. 9.

n isolated pea internode segments the effect of ndoleacetic acid on oxygen uptake is completely uppressed, or reversed, by a carbon monoxide/xygen ratio of 2·8/1, which inhibits only 20 to 5% of the basal respiration. The reversal by light f the CO-induced inhibition is followed by the brupt reappearance of the auxin effect on respiraion, which almost immediately reaches its naximum level. A marked stimulation of growth s observed even in the presence of a 2·8/1 CO/O_2 atio, which completely inhibits the effect on espiration. The ratio of growth with indoleacetic cid to growth in water is even slightly higher with O than in normal air. The absolute growth values f the segments treated with indoleacetic acid and O at a 2·8/1 ratio (in the dark) are consistently igher than those of the controls in distilled water nd air, though the O_2 uptake in the former is bout 25% lower than in the latter. These results, ntegrated with those of previous researches, are nterpreted as showing that the activation of verall oxidative metabolism is not a necessary preequisite for the effect of auxin on growth. Authors' summary. For earlier work, see *H.A.*, 9: 42.]—Univ. Milan.

86. Andreae, W. A., and van Ysselstein, M. W. H.
Studies on 3-indoleacetic acid metabolism. V. Effect of calcium ions on 3-indoleacetic acid uptake and metabolism by pea roots. VI. 3-Indoleacetic acid uptake and metabolism by pea roots and epicotyls.
Plant Physiol., 1960, **35**: 220-4, bibl. 13, and 225-32, bibl. 18.

The uptake of IAA from solutions by excised pea roots was low in the absence, and higher in the presence, of Ca ions. Excised root tips accumulated IAA to 10 times the external concentration by what appeared to be an active cyanide-sensitive process, whereas with epicotyl segments the process seemed to be physical, and the external concentration was not exceeded by that in the tissues. Accumulation depended in both cases on the initial external concentration, and the rate of uptake was limited by that of metabolic removal within the tissues. After 10 hours neither root tips nor epicotyls showed more than traces of internal IAA, except where the initial external concentration was too high to permit the biosynthesis of indoleacetylaspartic acid.—Pesticide Res. Inst., London, Ont.

87. Südi, J., Josepovits, G., and Matolcsy, G.
Morphological reactions of germinating seeds as criteria for the plant growth regulating activity of auxin-type chemicals.
Nature, 1960, **188**: 244-5, bibl. 6, illus.

A comparison of the gross morphological effects of an unknown concentration of 2,4-D on cucumber seedlings with a series of reference standards demonstrated that the logarithm of the 2,4-D concentration was determinable within the concentration range 0·03–1,000 p.p.m. with an accuracy of ±0·25. Similar determinations were possible with other seedling species, but generally within a narrower range of 2,4-D concentrations. —Res. Inst. Pl. Prot., Budapest.

88. Luckwill, L. C., and Lloyd-Jones, C. P.
Metabolism of plant growth regulators. I. 2,4-Dichlorophenoxyacetic acid in leaves of red and black currant.
Ann. appl. Biol., 1960, **48**: 613-25, bibl. 19, illus.

Detached leaves were placed with their petioles in a 10–12 p.p.m. solution of 2,4-D containing C^{14}, and transferred to an atmosphere free from CO_2, in darkness. After 1 week the red currant leaves had decomposed more than half, but the black currant leaves only about 2%, of the 2,4-D absorbed. In similar tests with 20 p.p.m. solutions of various herbicides, red currant leaves decarboxylated 2,4,5-T, 4-CPA and MCPA, but not 2-CPA, whereas black currant leaves had no action on any of these compounds. In both species part of the 2,4-D, 2,4,5-T or 2-CPA absorbed was metabolized into water-soluble, biologically inactive compounds, part into a biologically active compound, and a further 10–30% was chemically fixed by the leaf tissues. The high percentage of inactivation of 2-CPA explains its failure to produce growth responses in currants. Low concentrations of 2,4,5-T are lethal to red currants, in spite of the breakdown of this compound in the leaves being as rapid as that of 2,4-D. Red currants are highly resistant to 2,4-D, and black currants are extremely sensitive.—Long Ashton Res. Stat., Univ. Bristol.

89. Luckwill, L. C., and Lloyd-Jones, C. P.
Metabolism of plant growth regulators. II. Decarboxylation of 2,4-dichlorophenoxyacetic acid in leaves of apple and strawberry.
Ann. appl. Biol., 1960, **48**: 626-36, bibl. 7, illus.

Comparison of the metabolism of ^{14}C carboxyl-labelled 2,4-D in detached leaves of different varieties of apple showed that the 2,4-D-resistant Cox decarboxylated 57% of the 2,4-D in the leaf in 92 hours, whereas the susceptible Bramley's Seedling decarboxylated only 2% in the same time. Comparatively high rates of decarboxylation were found with all varieties of apple having Cox in their parentage; varieties unrelated to Cox showed low rates of decarboxylation. Similar high rates of decarboxylation were found in resistant varieties of strawberry and in *Syringa vulgaris*. Sixteen other species tested showed low rates of decarboxylation, irrespective of whether they were resistant or susceptible to 2,4-D. The rate of decarboxylation of 2,4-D in the mature strawberry leaf was proportional to the amount of 2,4-D in the leaf. Young leaves decarboxylated 2,4-D at about half the rate of fully grown or senescent leaves. As previously reported for currants [see previous abstract], part of the 2,4-D entering the leaf was bound and part inactivated by the formation of water-soluble compounds. The reaction of the strawberry variety Talisman to other herbicidal phenoxyacetic acids was similar to that previously reported for red currant. Leaves of Cox's Orange Pippin apple and Talisman strawberry were able to decarboxylate all these phenoxy-acids except 2-CPA. [From authors' summary.]—Long Ashton Res. Stat., Univ. Bristol.

90. Fang, S. C., Teeny, F., and Butts, J. S.
Influence of 2,4-dichlorophenoxyacetic acid on pathways of glucose utilization in bean stem tissues.
Plant Physiol., 1960, **35**: 405-8, bibl. 7.

2,4-D increased the uptake of labelled glucose after 7 days' treatment and caused a relative increase in the catabolism of glucose *via* the glycolytic sequences, but it did not affect the synthetic pathways for cellular constituents.—Ore. St. Coll.

91. Osborne, D. J., and Hallaway, M.
Auxin control of protein levels in detached autumn leaves.
Nature, 1960, **188**: 240-1, bibl. 11.

A continuation of the work on *Prunus serrulata* [*H.A.*, 29: 2056]. Detached green leaves were kept in a humid atmosphere and 2 drops of 2,4-D in ethanol were applied to each leaf. Within 6 days control leaves and untreated areas of treated leaves were turning yellow, but after 11 days the treated areas still remained green. Determination of N in control and treated leaf discs revealed that the protein level in the auxin-treated areas was maintained for periods of more than 2 weeks, during which time the total protein in the control leaves and in untreated parts fell to half its original value. The use of C^{14}-labelled 2,4-D showed that the labelled C was retained in the areas which remained green. A period of increased O_2 uptake by the leaves following removal from the trees was postponed in the treated compared with the non-treated areas.—Univ. Oxford.

92. Ghillini, C. A.
Lo iodio come biocatalizzatore nelle piante. **(Iodine as a biocatalyst in plants.)** [English summary ¼ p.]
Atti Ist. bot. Univ. Pavia, 1960, **17**: 171-83, bibl. 12.

Starch tri-iodide in a 0·4% aqueous solution was toxic to seedlings of white lupin. At lower concentrations (4×10^{-6}—4×10^{-4}) it had no effect on growth or root production in lupin or dwarf bean seedlings, although some authors in the past have claimed growth stimulation by I, KI or NaI in various plants.

93. Povolockaja, K. L., Baskakov, Ju. A., and Hovanskaja, I. V.
The interaction of uracil, riboflavin and maleic hydrazide in plants. [Russian, with English summary ½ p.]
Fiziol. Rast., 1960, **7**: 73-80, bibl. 23, illus.

In experiments with tomatoes and cucumbers both riboflavin and uracil were found to counteract the inhibiting effect of MH on growth and development and on the formation on indoleacetic acid. It is considered that MH possibly inhibits RNA synthesis and that riboflavin, uracil and indoleacetic acid counteract this effect.

94. Butenko, R. G., and Baskakov, Ju. A.
On the mechanism of the effect of maleic hydrazide on plants. [Russian, with English summary ⅓ p.]
Fiziol. Rast., 1960, **7**: 385-94, bibl. 29, illus.

The introduction of 10^{-2} g./l. of uracil into a nutrient medium containing sufficient MH (5×10^{-3} g./l.) to inhibit growth in isolated carrot callus tissue restored growth to its initial value. The transfer of tissues whose growth had been appreciably inhibited by the presence of 10^{-2} to 10^{-1} g./l. MH in the media to another medium containing uracil resulted in restored or even enhanced growth. Sodium ethylxanthogenate and riboflavin did not affect the growth of tissues which had been inhibited by MH.—U.S.S.R. Acad. Sci., Moscow.

95. Taylorson, R. B.
The nature of the maleic hydrazide inhibition and its relation to auxin processes.
Diss. Abstr., 1960, **20**: 3918-19, being *L.C. Card No. Mic.* 60-1021 of 115 pp.

he effect of autumn treatment with MH on the vels of endogenous stimulators and inhibitors as studied in *Rosa rugosa.* MH inhibited bud prouting in the spring, but no effect on 2 growth imulators and 1 inhibitor could be found that ould account for the inhibition. Studies on *vena* coleoptiles and potato discs showed that e initial action of auxin on cell wall enlargement profoundly affected by MH.—Univ. Wis.

96. Krajewska, E.
The influence of indolylacetic acid (IAA) and of maleic hydrazide (MH) on the time at which flower buds develop in *Perilla ocymoides* L.
Naturwissenschaften, 1960, **47**: 213-14, bibl. 9.

eed treatment with MH accelerated flowering in *erilla ocymoides* and also increased the sensitivity f the plants to photoperiodic induction. Plants aised from seeds treated with IAA did not differ gnificantly from the controls.—Dep. Plant hysiol., Polish Acad. Sci., Kraków.

97. Neumann, J.
The nature of the growth-promoting action of coumarin.
Physiol. Plant., 1960, **13**: 328-41, bibl. 17.

oumarin had a growth-promoting action on unflower and bean hypocotyls and pea epicotyls. ith a mixture of coumarin and IAA the stimutory effect was additive for a wide range of IAA oncentrations, when the coumarin concentration as that producing threshold stimulation, but it ecame progressively less than additive as the oncentration of coumarin was increased. Pre-eatment with coumarin enhanced the subsequent rowth stimulation of IAA. The promoting effect f coumarin on subsequent growth in IAA was ot found when the order of treatments was eversed.—Hebrew Univ., Jerusalem.

98. Linder, P. J., and Mitchell, J. W.
Rapid transport of α-methoxyphenylacetic acid introduced directly into the water stream of bean plants.
Bot. Gaz., 1960, **121**: 139-42, bibl. 5, illus.

stem puncturing technique, using a fine chiselaped wire, is described. Labelled α-methoxyhenylacetic acid moved upwards in the xylem, nd downward movement in the phloem only ccurred after it had reached the leaves.—S.D.A., Beltsville, Md.

99. Ruiz-Amil, M., and Flaig, W.
Influencia de la timohidroquinona sobre el metabolismo de carbohidrates en algunas dicotiledóneas. (**The effect of thymohydroquinone on the carbohydrate metabolism of some dicotyledons.**) [German summary 8 lines.]
An. Edafol. Agrobiol., 1960, **19**: 1-9, bibl. 13.

Bean seedlings in sand culture responded to the addition of $1 \cdot 5 \times 10^{-3}$ M or $1 \cdot 5 \times 10^{-4}$ M thymohydroquinone to the nutrient solution by a marked increase in the activity of aldolase, saccharase and amylase, but showed no change in reducing-sugar content. The same compound added to a hydroponic culture at $1 \cdot 5 \times 10^{-3}$ M had a more pronounced stimulatory effect on foliar enzyme action, but strongly inhibited the action of these same enzymes in the roots, and increased the plant's reducing-sugar content. At $1 \cdot 5 \times 10^{-5}$ M these sugars were not affected. Growth was stimulated at this concentration and at $1 \cdot 5 \times 10^{-4}$ M. Malonic acid at $1 \cdot 5 \times 10^{-3}$ M, or 10 or 20 times this concentration, decreased the reducing-sugar content. Leaf analyses after 1, 2 and 3 days showed that at the highest concentration of thymohydroquinone the actions of amylase and phosphatase were initially stimulated and later depressed, aldolase activity was stimulated throughout, and saccharase activity was finally reduced.—Inst. Biochem. Bodens, ForschAnst. Landw., Braunschweig.

100. Ruiz-Amil, M., and Flaig, W.
Influencia de la timohidroquinona sobre el metabolismo de ácidos orgánicos y sobre la respiración de las plantas. (**The effect of thymohydroquinone on the organic-acid metabolism and respiration of plants.**) [German summary 12 lines.]
An. Edafol. Agrobiol., 1960, **19**: 11-22, bibl. 22.

Thymohydroquinone at concentrations from 10^{-6} to 10^{-4} M increased root respiration in bean seedlings, and at 10^{-5} to 10^{-3} M in solution culture it increased their foliar keto acids. At the highest of these concentrations fumaric and malic acids decreased, and citric acid increased, in the leaves. High concentrations of both thymohydroquinone and malonic acid appeared to inhibit the same phase of organic-acid metabolism.—Inst. Biochem. Bodens, ForschAnst. Landw., Braunschweig.

101. Lowther, R. L., and Boll, W. G.
The effects of ethionine on some plant growth systems.
Canad. J. Bot., 1960, **38**: 437-57, bibl. 66.

Ethionine stimulated the rooting of excised, etiolated bean hypocotyls, the growth of sections from etiolated pea shoots, and the expansion of leaf discs from etiolated bean plants. Previous treatment of pea sections with Mn reduced or prevented the growth response. Leaf disc expansion was stimulated by maleic hydrazide, *o*-chlorophenoxyisobutyric acid, *m*-methyl phenoxyacetic acid, and 2,4,6-trichlorophenoxyacetic acid (TCPAA), but was not increased by EDTA, penicillin G or by the 2 "antiauxins" tested. At 10 mg./l. TCPAA completely replaced the stimulating effect of Co on light-treated discs. Ethionine, Co and TCPAA all inhibited chlorophyll synthesis in leaf discs exposed to light, and TCPAA caused a loss of yellow pigment in discs kept in the dark.—McGill Univ., Montreal, Que.

102. ČAJLAHJAN, M. H., AND OTHERS.
The production of gibberellin and the determination of its physiological activity in relation to its use on plants. [Russian, with English summary ½ p.]
Fiziol. Rast., 1960, **7**: 112-20, bibl. 24, illus.

Methods of production and testing in the U.S.S.R.

103. IMRE, E. M.
L'impiego in agricoltura delle gibberelline. A che punto siamo? (**The use of gibberellins in agriculture. What is the present position?**)
Ital agric., 1960, **97**: 811-19, illus.

A review, mentioning the results of treating seeds, vegetables, ornamental plants and vines.

104. STOWE, B. B.
Growth promotion in pea stem sections. I. Stimulation of auxin and gibberellin action by alkyl lipids.
Plant Physiol., 1960, **35**: 262-9, bibl. 29.

The slow growth of excised stem sections of tall and dwarf peas was accelerated by the following methyl compounds: myristate, palmitate, oleate, linoleate and arachidonate. Other effective substances were triolein, trilinolein and selachyl alcohol. For appreciable effects, sugar and auxin were necessary in the medium, and the action was further enhanced by gibberellic acid. The effect of the above lipids appears to be hormonal [see also *H.A.*, 29: 45].—Harvard Univ., Cambridge, Mass.

105. FANG, S. C., AND OTHERS.
Influences of gibberellic acid on metabolism of indoleacetic acid, acetate, and glucose in roots of higher plants.
Plant Physiol., 1960, **35**: 251-5, bibl. 15.

The catabolic pathways of glucose and acetate in pea root tissue as examined by the tracer method were not found to be affected to any significant extent by short-term GA treatment. However, GA treatment slightly increased the catabolic oxidation of C-1 and C-2 carbons of acetate. Chromatography and radioautography of the alcohol soluble constituents of pea root tissues which had been incubated with either acetate-1-C^{14}, acetate-2-C^{14} or glucose-U-C^{14} failed to reveal any major effect of short-term GA treatment, although the isotopic carbon of all 3 substances was rapidly incorporated into a variety of compounds in the plant. [From authors' summary.]—Ore. St. Coll., Corvallis.

106. KÖGL, F., AND ELEMA, J.
Wirkungsbeziehungen zwischen Indol-3-essigsäure und Gibberellinsäure. (**The interaction between indole-3-acetic acid and gibberellic acid.**)
Naturwissenschaften, 1960, **47**: 90, bibl. 6.

In pea plants gibberellic acid was shown to promote the biosynthesis of polyhydroxycinnamic acids which inhibit the 3-indoleacetic acid-oxydase system. The "auxin-sparing action" of gibberellic acid is therefore an indirect effect.—Organ.-chem. Lab., Reichs Univ., Utrecht.

107. LOCKHART, J. A., AND DEAL, P. H.
Prevention of red light inhibition of stem growth in the Cucurbitaceae by gibberellin A_4.
Naturwissenschaften, 1960, **47**: 141-2, bibl. 9.

Experiments with gibberellin A_4 applied to *Cucurbita pepo* and *Cucumis sativus* seedlings suggest that stem growth inhibition by visible radiation results from a reduction in the effective level of endogenous gibberellin.—Calif. Inst. Technol., Pasadena.

108. RAZUMOV, V. I.
The acceleration of flowering in short-day plants treated with gibberellin. [Russian.]
Fiziol. Rast., 1960, **7**: 354-7, bibl. 8, illus.

Experiments with perilla, Italian hemp and sunflower have shown that gibberellin is not a substitute for short-day treatment, but can accelerate the flower development induced by short days.

109. RESENDE, F., AND VIANA, M. J.
Gibberellin and sex expression.
Portugal. Acta biol., 1959, **6**: 77-98, bibl. 37, illus.

Gibberellic acid (GA) at 0·01%, applied on alternate days (with some interruptions) from March to July to plants of *Hyoscyamus niger* beginning to flower, induced reversion to the vegetative state, following the development of flowers in progressive stages of reduction from hermaphrodite to abortive female. The effects on this long-day species were similar to those of IAA. A clone of *Bryophyllum proliferum*, in which nearly all the flowers were female with reduced corollas, responded temporarily to winter treatment with GA by producing hermaphrodite flowers with full-sized corollas. Plants of *B. diagremontianum* kept under artificial short-day conditions in summer were stimulated by GA to form flower buds, but further treatment with 0·005% GA failed to cause reversion to the vegetative condition, giving only a temporary reduction in bud formation. The arkedly different responses in these *Bryophyllum* pecies from those of *H. niger* are attributed to the ormer being long-short-day plants. Vegetative lants of *Aloe bulbifera* in natural short-day onditions were not stimulated to flower by ·005% GA, and plants with developing inorescences responded to the same treatment by howing retarded flower development and vegetaive stimulation of flower stalks and bracts, but o reversion to a general vegetative state.—Inst. ot., Univ. Lisbon.

Storage.

110. Ministry of Agriculture, London.
Control of air conditions in horticultural stores.
Hort. Mach. Leafl. Minist. Agric. Lond. **6**, 1960, pp. 8, illus.

Advice on planning, refrigeration and management of cold and gas stores for fruit, vegetables nd flowers.

111. Serini, G., and Ripamonti, A.
La conservazione della frutta e degli ortaggi in atmosfera confinata a bassa percentuale di ossigeno. (**Storage of fruit and vegetables in a confined atmosphere with a low percentage of oxygen.**) [English summary 5 lines.]
Riv. Ortoflorofruttic. ital., 1960, **44**: 231-42, bibl. 18, illus.

Tests were conducted with a double-walled metal hamber, insulated with glass wool, and provided vith means of controlling the composition, ressure, temperature and R.H. of the internal atmosphere. A mixture of 7·5–9·5% oxygen and 92·5–90·5% nitrogen at temperatures ranging rom 8 to 13° C. and R.H. 75–90% kept dessert grapes in excellent condition for 13 weeks. Under similar conditions lemons were stored for 30 days, eaches for 14 days, lettuces, spinach and cauliflowers for 7 days and chicory and endive for 5 days, with very satisfactory results. The absence of condensation was a great advantage and greatly reduced the incidence of disorders and diseases compared with cold storage conditions.

Weed control.

(*See also* 88, 89, 127, 918.)

112. Johnson, C.
Management of weeder geese in commercial fields.
Calif. Agric., 1960, **14**(8): 5.

White Chinese geese have proved the most effective breed for weed control in crops such as vines, castor beans, strawberries, melons, beans, hops, asparagus and nursery crops. Details are given on fencing, watering and supplemental feeding.

113. Hughes, E. C., and Davis, W. E. P.
Aquatic weed control.
Res. Rep. west. Sect. nat. Weed Cttee Canada, *1959*, pp. 74-5.

Three reports were received, in one of which the outstanding effectiveness of monuron at 58 lb. acre against weeds on drainage ditch banks is recorded. —From *Weed Abstr.*, **9**, No. 990.

114. Loerch, K.
Chemical weed control in windbreaks.
Ext. Circ. Univ. Neb. Coll. Agric. 60-1733, 1960, pp. 4.

Practical hints on using diuron or simazine at 4 lb. acre.

115. Woodford, E. K., and Kasasian, L.
Some new herbicides: developments in chemical weed control 1958-60.
Chem. Ind. Lond., 1960, No. 36, pp. 1118-25, bibl. 30.

An outline is given of a classification of herbicides based upon their chemical constitution and not on mode of action or method of use. Experimental work with new herbicides is reviewed and basic research briefly described.

116. Riepma, P.
Interrelationships between methods of spray application, retention, and weather conditions on the herbicidal efficiency of 2,4-dinitro-ortho-cresol.
Plant and Soil, 1960, **12**: 223-48, bibl. 26.

The test plants were rape, buckwheat, peas and wheat. The spray output was varied between 0·55 and 20 cu.mm. per sq.cm. and the mean droplet size between 160 and 408 μ. For output values up to 15 cu.mm. per sq.cm. retention was proportional to the volume of spray reaching the leaf surface, irrespective of mean droplet size. For a given output the proportion retained was inversely related to the mean droplet size. In peas retention was increased by lowering the surface tension of the spray solution or pre-treating the plants with trichloroacetic acid. Irrespective of output or droplet size, the equi-effective dose (i.e. that required to kill half the plants) of DNC remained constant. Tests with rape showed that the magnitude of this dose depended mainly on the amount of solar radiation received within the first few hours of spraying.

117. Bruinsma, J.
The action of 4,6-dinitro-*o*-cresol (DNOC) in soil. 1. The emergence from cress seed in DNOC-treated soil mixtures.
Plant and Soil, 1960, **12**: 249-58, bibl. 17.

The addition of initially poisonous amounts of the herbicide DNOC to non-sterilized soil enhances the ultimate emergence percentage from cress seeds, if these are sown some time after the DNOC treatment of the soil. DNOC is removed from soil mainly by microbial activity. The increase in the emergence percentage cannot be ascribed to a stimulation, exerted either by DNOC or by some breakdown product of DNOC. The ultimate emergence percentage of cress seedlings in sterilized soil surpasses that in non-sterilized soil. It is suggested that the more complete emergence after DNOC addition to non-sterilized soil is due to a partial sterilization of the soil by DNOC, the advantages of which remain after removal of the DNOC by the remainder of the microflora. This theory is discussed in relation to the yield-increasing effect of DNOC sprays. [From author's summary.] —Plant physiol. Res. Centre, Wageningen.

118. Renney, A. J., and others.
Basic studies [in weed control].
Res. Rep. west. Sect. nat. Weed Cttee Canada, 1959, pp. 119-21.

Monuron at 0·01–100 p.p.m. was found to have no effect on the catalase activity of fresh spirea buds, nor on the oxidase activity of fresh forsythia flowers; a peak in the lipase activity of castor beans was observed at 10 p.p.m. Protease activity of Austrian field peas was increasingly inhibited with increasing concentrations of monuron above 1 p.p.m.—From *Weed Abstr.*, **9**, No. 1056.

119. Ragab, M. T. H.
Part I. Colorimetric methods for the determination of 2-chloro-4,6-bis (ethylamino)-1,3,5-triazine (simazine) and related compounds. Part II. Degradation of C^{14}-labeled simazine [2-chloro-4,6-bis (ethylamino)-1,3,5-triazine] by plants and soil microorganisms.
Diss. Abstr., 1960, **20**: 4507-8, being *L.C. Card No. Mic.* 60-1612 of 115 pp.

Four methods for the colorimetric determination of simazine were developed. Studies of the absorption of labelled simazine by cucumber and corn seedlings showed that both resistant and susceptible plants will absorb, translocate and metabolize simazine.—Univ. Ill.

120. Granström, B.
TCA mot kvickrot. **(TCA for couch grass control.)** [English summary ¾ p.]
Medd. Lantbruksh. Jordbruksf. **105**, 1960, pp. 20, bibl. 22.

TCA for the control of couch grass (*Agropyron repens*) is best applied during the winter (February and March), although in the north of Sweden an autumn treatment to frozen soil before the snow period is recommended. Rates of 20–25 kg. per ha. have proved satisfactory. After TCA treatment some rain is needed before planting peas to avoid plant injury. Beets and brassicas were generally not affected when TCA was used a month before sowing. Dalapon was slightly more effective than TCA, when both materials were mixed with the soil.

121. Kradel, J., and Feyerabend, G.
Zur nematiziden und herbiziden Wirkung von Na-N-methyldithiocarbamat. **(On the nematicidal and herbicidal action of Na-N-methyldithiocarbamate.)** [Russian and English summaries 21 and 18 lines.]
NachrBl. dtsch. PflSchDienst, Berlin, 1960, **14**: 54-9, bibl. 15.

As a non-selective herbicide on paths the soil fumigant (Vapam), used as a solution at 45 c.c./sq.m., proved more effective than sodium chlorate, though its action was not so prolonged. The perennial weeds of ditches required two applications. *Agropyron repens* on farm land was also controlled. The application of Vapam is thought to be economical only if combined use can be made of the preparation's nematicidal, fungicidal and herbicidal properties.—Biol. Zentralanst. Berlin.

Plant protection.

(*See also* 181, 182, 829, 990, 1108, 1636, 1638, 1660, 1670, 1680.)

122. L'Association des Ingénieurs de Gembloux.
La phytovirologie au service de l'agriculture. **(The study of virus problems as an aid to agriculture.)**
Ann. Gembl., 1958, **64**: 293-351, bibls.

Papers given on this "virus" day dealt with the following subjects: Introduction to plant virology and virus control; The "ultra-virus" concept; Chromatography and electrophoresis in the biochemical study of plant viruses; Serology in the identification of plant viruses; Present tendencies in plant virology.

123. Kooistra, G.
Investigations into the chemotherapeutic activity of nitroso hydroxyaryl compounds towards some virus diseases.
Acta bot. neerl., 1959, **8**: 373-421, bibl. 128.

Several compounds which were claimed to inhibit virus multiplication were investigated, and promising results were observed with nitroso hydroxyaryl compounds. In exploratory field trials with french and broad beans p-nitrosophenol and 1-nitroso-2-naphthol showed anti-viral properties; nitroso-thiouracil mixtures were effective in tobacco without being phytotoxic. The results of the field trials (most of which were on sugar beet) showed that a concentration of 0·1% was best, and that no more than three sprays should be applied.—Shell Res. Ltd., Sittingbourne, Kent.

124. Levin, R.
Non-medical uses of antibiotics. II. Horticulture.
Chem. Prod., 1960, **23**: 157-60, from abstr. in *J. Sci. Food Agric.*, 1960, **11**: i-53.

The formulation, use, mode of action, and effect f cycloheximide, griseofulvin, nystatin, antimycin nd helixin.

125. Bolore, M.
Un nouvel antibiotique actif contre certaines bactéries et champignons microscopiques. **(A new antibiotic active against certain bacteria and microscopic fungi.)**
C.R. Acad. Agric. Fr., 1960, **46**: 373-4.

brief note on the properties of a bacterium olated from a watercress bed and named *Coccoacillus yannicus*. Investigations are in progress on s effects on the ink disease of sweet chestnut *hytophthora* sp.), on *Fusarium* in the banana and *usarium* in the oil palm.

126. Cruickshank, I. A. M., and Perrin, D. R.
Isolation of a phytoalexin from *Pisum sativum* L.
Nature, 1960, **187**: 799-800, bibl. 4.

n antifungal compound was isolated from the iffusate of pea pods inoculated with a fungal uspension. A description is given of the properties f the compound, for which the name "pisatin" is uggested. [See also *H.A.*, 29: 31 and 32.]—.S.I.R.O., Canberra.

127. Marshall, K., and Hey, G. L.
A guide to modern pesticides.
Grower, 1960, **54**: 262.
A guide to modern herbicides.
Grower, 1960, **54**: 302-3.

rief notes on the origin, chemical composition, ction and use of recently introduced insecticides, erbicides, and one fungicide (Allisan).

128. Pickard, J. A., and Martin, J. T.
Spray application problems: LX. The uptake of mercury by plant tissues.
A.R. Long Ashton agric. hort. Res. Stat., 1959, 1960, pp. 93-100, bibl. 7.

xperiments on the penetration and distribution ithin plant tissues of mercury applied as phenylercuric acetate are described. Absorption occurs ithin a few days from the surfaces of apple leaves nd fruits: some is firmly held in the cuticles of the ruits and some appears in the flesh. Mercury is aken up by the roots of plants from nutrient olution or soil, but little is translocated to the ops. The results of the examination of the curds nd roots of broccoli plants treated at the seedling tage with calomel or mercuric chloride are eported, and the natural mercury content of fruits nd vegetables is discussed. [Authors' summary.]

129. Mellini, E.
Insetticidi biotici: il *Bacillus thuringiensis*. **(Bacterial insecticides: *Bacillus thuringiensis*.)**
Progr. agric., 1960, **6**: 693-9, illus.

he numerous insect pests susceptible to this acillus are listed. The larvae of the Lepidoptera re particularly susceptible. Brief information is iven on the commercial preparations available, nd on methods and rates of application.

130. Mendes, L. O. T.
Intervalos entre tratamentos inseticidas. **(Intervals between insecticidal treatments.)** [English summary 10 lines.]
Bragantia, 1959, **18**: 275-81, bibl. 1.

In the equation presented the calculation of the interval depends on the length of the insect's life cycle, its reproductive potential, the percentage infestation permissible and the efficiency of the insecticide.—Inst. agron., São Paulo.

131. Anon.
Tedion, specific ovicide.
Pest Technol., 1960, **2**: 256-9.

Chemical, physical and biological properties, toxicity and application, particularly as a selective acaricide for use on numerous horticultural crops.

132. Fritzsche, R.
Morphologische, biologische und physiologische Variabilität und ihre Bedeutung für die Epidemiologie und Bekämpfung von *Tetranychus urticae* Koch. **(Morphological, biological and physiological variability and their importance in studies of epidemic populations and control of *Tetranychus urticae*.)**
Biol. Zbl., 1960, **79**: 521-76, bibl. 68, illus.

The development of *Tetranychus urticae* is dependent on temperature, humidity and the host plant. Dwarf beans were the best host plants for mite development, which was delayed on tomato and cyclamen. The highest rate of reproduction, on the other hand, occurred on calla and strawberry hosts, and the lowest on beetroot, tomato and cyclamen. The rate of reproduction was directly related to the content of reducing sugars in the hosts' leaves, and leaf contents of asparagine, aspartic acid, glutamine and glutamic acid also affected the rate of oviposition. Other factors which were related to reduced oviposition were leaf ageing, decreased day length and increased mite damage. Variations in mite susceptibility to acaricides were studied, using methyl parathion. Mite resistance to parathion increased as the host leaves aged, as mite injury increased, and as leaf sugar contents increased. Mites on tomato were the most susceptible to parathion, and those on beetroot were the most resistant, but a change of host altered mite susceptibility. However, with parathion-resistant strains of mite there was no change in mite resistance with a change of host plant.—Inst. Phytopath., Aschersleben.

133. Grujičić, G.
Efikasnost nekih nematicida kod suzbijanja korenove nematode u staklarama. **(The efficacy of some nematicides for the control of root nematodes in hot houses.)** [English summary 1 p.]
Zasht. Bilja, 1959, No. 55, pp. 63-8, bibl. 8, illus.

Neither D-D at 60 c.c. per sq. m., EDB at 60 c.c. per sq. m. nor CS_2 at 200 g. per sq. m. gave 100% kill of *Heterodera marioni* in hot house soils, but D-D was the most promising.

Chemical residues and their analysis.

(*See also* 128, 148, 584, 696, 698, 770, 830, 1648.)

134. Ciferri, R., and Scardavi, A.
Velocità di scomparsa dello zineb dalle foglie di varie piante. (**The rate of disappearance of zineb from the leaves of various plants.**) [English summary ½ p.]
Atti Ist. bot. Univ. Pavia, 1960, **17**: 129-37, bibl. 4.

At 20 and 30° C. there was practically no disappearance of zineb from glass plates or dried leaves of apple, lettuce and vine within 16 days of application, but at 40° C. about 40% had disappeared in each case. When applied to living leaves, however, only 29% of the zineb remained on vine leaves after 16 days at 20° C., the percentages for apple and lettuce being 59 and 80, respectively. Over the same period at 30° C. the corresponding residues were 34, 56 and 62%. The results imply some decomposition of zineb by living leaves.

135. Dormal, S.
Étude de la persistance des résidus de pesticides dans les fruits et les légumes. (**The persistence of pesticide residues in vegetables and fruits.**)
Ann. Gembl., 1959, **65**: 100-12, bibl. 34.

After a discussion of the various factors affecting persistence of residues, data are tabulated on the following points: (1) the breakdown products of some 15 pesticides; (2) the length of time between application and the residues of 9 pesticides dropping to half their content on 4 vegetables and 3 fruits; (3) the time taken to get within the tolerance limits set by law in the U.S.A. for 6 pesticides on 4 vegetables and 3 fruits; and finally (4) on the same plants the amount of time necessary to bring the residues down to 0·1 p.p.m.

136. Daum, R. J., and Dewey, J. E.
Measuring the surface area of apples for expression of pesticide residues.
J. econ. Ent., 1960, **53**: 462-7, bibl. 16.

A study was conducted to determine the accuracy of surface area measurement computed from the volume of water displaced and from the weight, assuming the apples to be spheres, and to compare these methods with others reported in the literature. Both the volume displacement and the weight methods were superior to the others.—Cornell Univ., Ithaca, N.Y.

137. Coulson, D. M., and others.
Microcoulometric gas chromatography of pesticides.
J. agric. Food Chem., 1960, **8**: 399-402, bibl. 6.

A description of a rapid method of pesticide residue analysis suitable for both the chlorinated organic pesticides and the thiophosphates. [See also *H.A.*, 29: 2355.]—Stanford Res. Inst., Menlo Park, Calif.

138. Goodwin, E. S., and others.
The analysis of crop extracts for traces of chlorinated pesticides by gas-liquid partition chromatography.
Chem. Ind. Lond., 1960, No. 39, pp. 1220-1, bibl. 3.

By this method crop material treated with 0·05 p.p.m. of aldrin and 0·1 p.p.m. of dieldrin has been satisfactorily chromatographed without the need for preparatory cleaning.—Woodstock agric. Res. Cent., Sittingbourne, Kent.

139. Meagher, W. R., and others.
Colorimetric determination of Guthion residues in crops.
J. agric. Food Chem., 1960, **8**: 282-6, bibl. 11.

Based on alkaline hydrolysis to anthranilic acid; procedures are described for fruit, vegetables, etc.

140. Martin, J. T.
Spray application problems. LXI. The persistence of lonchocarpus deposits on plants.
A.R. Long Ashton agric. hort. Res. Stat., 1959, 1960, pp. 100-2, bibl. 7.

In England lonchocarpus deposits on plants in the field (gooseberry leaves and fruits and black currant leaves) persisted for a week in cool dry weather, but under conditions of bright sunshine and high temperature the toxic compounds quickly vanished.

141. Gutenmann, W. H., and Lisk, D. J.
Rapid determination of mercury in apples by modified Schöniger combustion.
J. agric. Food Chem., 1960, **8**: 306-8, bibl. 4, illus.

Apple tissue is dried on cellophane overnight under vacuum, then burned in an oxygen-filled flask with a balloon attached for pressure control. Mercury is determined spectrophotometrically after extraction of the absorbing solution with dithizone. Recovery of mercury from apples in the 0·3–0·6 p.p.m. range averaged 83·6%. Up to 0·18 p.p.m. of mercury was found in apples treated with mercurial fungicides for scab control.—Cornell Univ., Ithaca.

142. Taschenberg, E. F., and Avens, A. W.
Parathion and EPN residue studies on Concord grapes.
J. econ. Ent., 1960, **53**: 441-5, bibl. 21.

After the final application in a 3-spray programme, used for the control of grape berry moth (*Paralobesia viteana*), deposits of EPN persisted somewhat longer than those of parathion. The ethod of residue determination is described and scussed.—N.Y. St. agric. Exp. Stat., Geneva.

43. Daum, R. J.

A statistical study of parathion and DDT residues on apples.

Diss. Abstr., 1960, **20**: 4471, being *L.C. Card No. Mic.* 60-1891 of 184 pp.

n the field the use of 1 ml. of benzene to each ·51 sq. cm. of surface area stripped significantly ore parathion from the fruit than did ratios of ; 5·11 or 1 : 10·91. These ratios were equally fective in stripping DDT residues from fruit amples. Tumbling (at 59 r.p.m.) for 10, 15 or 0 min. gave equally good results for both secticides. The ratios 1 : 7·75, 1 : 5·17, and : 3·88 were equally efficient in stripping paraion residues from leaf samples. For DDT ecovery from leaf samples 1 : 3·88 was more fficient than 1 : 5·17 or 1 : 7·75. Immediately fter parathion application three tumbling times ave equally good results, but after weathering the ongest tumbling time was most effective. All umbling times were equally efficient in stripping DDT residues from leaf samples. Approximately 5% and 90% of the total variance of parathion uit and leaf residues, respectively, were due to ariation within the tree. The variations between e trees and within the trees of DDT fruit and leaf esidues were approximately equal. Correlation oefficients between parathion and DDT residues n fruit and leaf surfaces were smaller than xpected, but were mostly highly significant. There as no correlation between the surface area of the pple samples and the micrograms of DDT eposits. In order to detect a difference of 10% f the mean at 19 : 1 odds, about 312 and 180 uits and 2,185 and 1,799 leaf discs were needed or parathion and DDT, respectively. Studies in e laboratory showed that the variation of eterminations made on different days or weeks as unimportant in relation to other sources of ariation in colorimetric determinations of the esidues: neither insecticide decomposed during weeks' storage in the presence of fruit extracts. pple fruit extracts obtained in normal stripping rocedures seriously affected the accuracy of etermining parathion residues, but DDT residues ere not affected. The addition of apple fruit xtracts slightly improved the recovery of DDT ut significantly reduced parathion recovery. The chechter-Haller method for determining DDT esidues was nearly twice as precise as the Averell-Norris method for determining parathion residues. pproximately 14% of the total variance of arathion field samples occurred in analytical eterminations, as compared with 7% for DDT. t is suggested that, for critical work, at least two arathion determinations should be made on each ample.—Cornell Univ.

144. Zweig, G., Archer, T. E., and Rubenstein, D.

Residue analysis of a chlorinated insecticide (thiodan) by combination of gas chromatography and infrared spectrophotometry.

J. agric. Food Chem., 1960, **8**: 403-5, bibl. 12.

A description of the method, which has been successfully applied to pears and peaches.

145. Batchelder, G. H., and Patchett, G. G.

A colorimetric method for the determination of EPTC residues in crops and soils.

J. agric. Food Chem., 1960, **8**: 214-16, bibl. 3.

Tested here on a wide range of vegetables and soft fruits, the method consists of hydrolysis of the herbicide in sulphuric acid and the formation of the cupric dithiocarbamate complex which has an absorption peak at 440 mμ.—Stauffer Chem. Co., Richmond, Calif.

Experimental and statistical techniques.

(*See also* 105, 119, 122, 136-139, 141, 144, 257, 329, 332, 382, 403, 416, 448, 458, 575, 841, 922, 962, 986, 987, 998, 1275, 1416.)

146. Tumanov, I. I., Kuzina, G. V., and Karnikova, L. D.

Growing plants in gravel for research purposes. [Russian, with English summary 7 lines.]

Fiziol. Rast., 1960, **7**: 320-5, bibl. 1, illus.

Equipment is described and illustrated for growing plants in small granite chips (3–7 mm.) in pots and in small beds (157 × 130 cm.) under glass. Rows of pots are interconnected to enable the nutrient solution, which is supplied from bottles on a trolley, to be applied, collected and re-circulated by means of a drainage tank and pump. The beds are arranged similarly but with a fixed supply tank. The solutions are usually renewed weekly. Apricot seedlings and rooted cuttings of black currant were grown successfully in the pots and tomatoes in the beds.

147. Hack, H. R. B.

Solar radiation measurements and the design of research glasshouses.

J. agric. Engng Res., 1960, **5**: 336-40, bibl. 3, illus.

To make satisfactory use of solarimeter measurements it appears necessary to eliminate shadows from horizontal members. For experiments where observations are being made in periods of 1 hr. or less, shadows from vertical members should also be eliminated, but where observations are at 4-hr. intervals and the solarimeter is close to the plant, this would not seem necessary. [From author's conclusions.]—Glassh. Crops Res. Inst., Littlehampton.

148. Arkley, T. H., Munns, D. N., and Johnson, C. M.
Preparation of plant tissues for micronutrient analysis. Removal of dust and spray contaminants.
J. agric. Food Chem., 1960, **8**: 318-21, bibl. 8.

Three herbaceous plants, including tomatoes, were dusted with soil or sprayed with a simulated bordeaux spray containing copper, iron, manganese, molybdenum and zinc. The effectiveness of removal of contamination by dilute hydrochloric acid or dilute hydrochloric acid plus detergent was measured. Dust contamination was removed satisfactorily by both wash solutions. Spray contamination was difficult to remove by washing. The wash solutions and procedures used did not result in loss of elements from within the tissues. [From authors' summary.]—Univ. Calif., Berkeley.

149. Whittig, L. D., Buchanan, J. R., and Brown, A. L.
X-ray fluorescence determination of zinc in plant tissue.
J. agric. Food Chem., 1960, **8**: 419-21, bibl. 11.

The method is described. Reasonable accuracy was obtained by correlating the ratio of Zn emission to radiation scatter with Zn concentration in the plant material.—Univ. Calif., Davis.

150. Lawrence, J. M., Miller, J. U., and Rasmussen, L. W.
Estimation of amino acids in plant tissue by paper chromatography.
Tech. Bull. Wash. St. agric. Exp. Stats **32**, 1960, pp. 12, bibl. 14, illus.

Plant tissue is extracted with 70% alcohol and the acids separated from the extract by ion exchange columns. The mixture of acids is then resolved by means of 1-N 2-dimensional paper chromatography and a colour developed by spraying the paper with ninhydrin under standard conditions. The spots are then cut out, weighed and the colour leached out in a glacial acetic acid ethanol (1 : 1) solvent. Colours may then be measured on a colorimeter at 560 mμ.

151. Diener, T. O., and Lasheen, A. M.
The determination of nucleic acid content and composition of fruit tree and other plant leaves.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 195-206, bibl. 25.

A method for the quantitative analysis of ribonucleic acid (RNA) content and composition of fruit tree and other plant leaves is described. The method is based on the Schmidt and Thannhauser procedure [*J. biol. Chem.*, 1945, **161**: 83-9], but quantitative analysis is made by ion-exchange chromatographic separation of the ribonucleotides, followed by ultra-violet spectrophotometry. Data on the suitability of the method are presented, and the nucleotide composition of the leaf RNA's of several plant species [including *Prunus* and *Fragaria* spp. and hops] is given. [Authors' summary.]—Irrig. Exp. Stat., Prosser, Wash.

152. Castorina, S., and Fagotti, B.
Carotene e proteine per via elettrochimica da succhi vegetali. (**Electrochemical extraction of carotene and protein from plant juices.**)
Ital. agric., 1960, **97**: 707-15, bibl. 1, illus.

The apparatus and method of extraction are described. Suitable raw materials are fruit, vegetables and fodder crops.

153. Bidmead, D. S., and Welti, D.
Isolation and identification of volatile fruit-flavours.
Research, Lond., 1960, **13**: 295-9, bibl. 7.

A method is described for the extraction with ethyl chloride of a water-free mixture of the flavour components of fruits, and for separation of the components by gas chromatography. Infra-red and mass spectroscopy and chromatography were used to identify the isolated compounds.—Unilever Ltd., Sharnbrook, Bedford.

154. Powell, L. E.
Separation of plant growth regulating substances on silica gel columns.
Plant Physiol., 1960, **35**: 256-61, bibl. 8.

Simpler and more rapid than paper chromatography for indole derivatives and naturally occurring growth substances.

155. King, J. R.
The peroxidase reaction as an indicator of pollen viability.
Stain Tech., 1960, **35**: 225-7, bibl. 2.

The test medium, which must be used immediately, consists of 10 ml. of 2% agar, 5 ml. of hydrogen peroxide and 1·8 ml. of 1% benzidine (base) in 60% ethyl alcohol. Viability is assessed by reactions, which differ between species. For example, viable sugar cane pollen grains turn an intense blue, whereas viable tomato pollen grains become enlarged, appear colourless and are ovoid in shape.—La St. Univ., Baton Range.

156. Metz, R. W.
Differential disease development as a measure of entrance and movement of a fungicide within cucumber seedlings.
Diss. Abstr. 1960, **20**: 3937, being *L.C. Card No. Mic.* 60-1202 of 50 pp.

A method was developed for the evaluation of chemicals possessing the ability to enter and move within plants. It was based on the differential development of leaf spots, caused by *Colletotrichum lagenarium*, on the first or second true leaves of ucumber seedlings following the application of n antibiotic, pleocidin, prior to inoculation with he pathogen.—Ohio St. Univ.

157. Neves, C. M. B., and Costa, A. G.
Nota sobre a detecção de ataques ocultos de insectos no feijão e amendoim pelo método dos raios X. **(A note on the detection of invisible attacks by insects on beans and peanuts by the X-ray method.)**
Garcia de Orta, 1959, **7**: 71-5, bibl. 11, illus.

he apparatus and the method of taking radioraphs are described. The radiographs also showed he full extent of an infestation of bean seeds by *abrotes subfasciatus* which was just becoming isible.

158. Federer, W. T.
Some illustrative examples of "treatment design" and the interpretation of experimental results.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 811-18, bibl. 14.

ndicating the types of problem encountered in the election of treatments.

159. Richard, L.
Adaptation to field experiments of the "variantes systématiques" method.
Fertilité, 1959, No. 7, pp. 21-31, bibl. 9.

tatistical methods to determine the optimum quilibrium between 2 or 3 nutrients.

160. Bleasdale, J. K. A., and Nelder, J. A.
Plant population and crop yield.
Nature, 1960, **188**: 342, bibl. 8.

Comments on a number of equations relating yield o density.

161. Elek, L.
A gyümölcstermelés felmérésének statisztikai módszere. **(A statistical method of assessing fruit production.)** [Russian and German summaries 1 p. each.]
Kísérl. Közlem., Sect. C, 1959, **52C**(2): 171-98, bibl. 15.

n Hungary, in both commercial and private rchards.

Practical and research equipment.

(*See also* 19, 33, 70, 285, 334-336, 417, 461, 603, 705, 755, 836, 924, 925, 1155, 1214, 1657, 1664.)

162. Anon.
Machine pour culture des interlignes Simar-5CV. **(The Simar-5CV machine for inter-row cultivation.)**
Rev. hort. suisse, 1960, **33**: 325-6, illus.

hand-operated, motor-powered machine with nterchangeable wheels of 2 sizes and attachments or hoeing, earthing up, unearthing and rotary ultivation; particularly suited to viticulture.

163. Listov, P. N., and Mjakišev, N. F.
An electric tool for soil tillage under the spread of the crown. [Russian.]
Izv. Timirjazev. sel'sk. Akad., 1960, No. 1, pp. 149-68, bibl. 2, illus.

A complex mathematical analysis of the man-hours saved by an electrically-operated rototiller used in various types of top and soft fruit orchard as compared with hand labour. [See also *H.A.*, 29: 1068.]

164. Biteau, L.
Le rouleau chauffant en culture maraîchère. **(The heated roller in market gardening.)**
Rev. hort. Paris, 1960, **132**: 2241, illus.

Rollers heated by internal gas flames are used on the wet soils of Loire-Atlantique to prevent the soil sticking and thus make it possible to obtain a firm seedbed at an earlier date.

165. Anon.
Grubber lifts three bushes a minute.
Grower, 1960, **54**: 607, illus.
This new tool removes drudgery from soft fruit grubbing.
Comm. Gr, 1960, No. 3377, p. 624, illus.

The implement, which looks like a miniature fork loader, has an iron frame fitting onto the 3 point tractor linkage. Hinged to the frame is a fork with 4 stout prongs about 12 in. long. In operation the tractor works in reverse. The expected cost is £25–30.

166. Clifford, E. D.
A rapid method of fumigating nursery soils with methyl bromide.
Tree Plant. Notes, 1959, **37**: 9-10.

A machine is described and illustrated which lays a polythene film over seedbeds and, as it does so, injects methyl bromide into the bed in the form of vapour. It takes half a man-hour to treat a bed 4×525 ft., compared with 10 man-hours for manual application. A machine called the "Polytriever" has been developed to pick up and re-roll the polythene cover.—*Weed Abstr.*, **9**, No. 1051.

167. Statens Forsøgsvirksomhed i Plantekultur.
Forsøg mit typer af potter til udplantningsplanter 1956-58. **(Experiments on the types of pot used for potting up, 1956-58.)**
Tidsskr. Planteavl, 1960, **64**: 157-9.

The merits were studied of 6 types of pot used for potting up tomatoes, cauliflowers, cucumbers and chrysanthemums. Clay, Jiffy and soil pots were found to be equally satisfactory from the cultural point of view.

168. Lake, J. V.
Choose your plastic pots carefully.
Grower, 1960, **54** (Glasshouse Suppl.): 17-19, illus.

Factors which should govern the choice of a plastic pot are discussed. Studies on the effect of pot transparency on root growth have shown only a small effect with tomatoes and cucumbers, but a greater effect with China asters, stocks and calendulas, for which a transparent pot is to be preferred. Watering of plastic pots requires a new technique, and such pots should have adequate drainage. Tomato growth in plastic pots that are carefully watered may reach 50% more than in clay pots.—N.I.A.E., Silsoe, Beds.

169. ANNING, R.
Quicker budding with a Mexican knife.
Grower, 1960, **54**: 717, illus.

With 2 sharpened edges, along one side and across the chisel-like end.

170. GATIN, Ž. I.
Polyvinylchloride film—a new material for tying grafts. [Russian.]
Sadovodstvo, 1960, No. 5, pp. 30-1.

Strips 12 mm. wide and 0·08–0·1 mm. thick.

171. MARSHALL, R.
New uses for electric heating cables.
Grower, 1960, **54** (Glasshouse Suppl.): 9-11, illus.

In a heat therapy unit and a mobile glasshouse.

172. ŽDANOVIČ, G. A., AND EMEL'JANOV, V. D.
Machines for separating and drying grape seeds. [Russian.]
Vinodelie i Vinogradarstvo, 1960, **20**(5): 46-9, bibl. 1, illus.

Grape seeds are a source of oil, tannin, furfurol, phytin and some other products. An illustrated description is given of a machine designed for extracting the seeds from the press residues, which consists of a scraper elevator, shaker, lower and upper mesh frames, blower, cam shaft, electric drive and carriage. The seed can be dried naturally in the open or rapidly in conveyor driers such as are used for fruits and vegetables.

173. HAHN, —., AND RUYSSEN, —.
Note sur un appareil à dosage rapide d'humidité. (**Note on an apparatus for the rapid determination of moisture content.**)
Agron. trop., 1960, **15**: 346-9, illus.

The apparatus determines the moisture content of samples, weighing 350–500 g., of seeds, foods, composts, etc., by measuring the specific conductivity. The samples require no preparation, and can be recovered unchanged.—Serv. Normal., Technol. et Règl. des Frandes, Orstom.

174. CAVALLINI, G.
Determinazione dell'umidità dei prodotti organici ed inorganici e dell'umidità relativa dell'aria. (**The determination of moisture in organic and inorganic products and of the relative humidity of the air.**)
Tabacco, 1960, **64**: 3-47, bibl. 13, illus.

Apparatus and methods applicable to tobacco and other products.

175. ČATSKÝ, J., AND SLAVÍK, B.
A field apparatus for determining the intensity of photosynthesis. [Russian, with Czech and English summaries 8 lines each.]
Biol. Plant., Prague, 1960, **2**: 107-12, bibl. 14, illus.

The apparatus, for use in the field, operates on the basis of a continuous-flow gasometric method with a visual colorimetric determination of CO_2 concentration in air. The case in which it is carried measures 35×26×17 cm. and its total weight is 6 kg.—Czech. Acad. Sci., Prague.

176. HANAN, J. J., AND HOLLEY, W. D.
A temperature house for plant research.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 799-803, bibl. 5, illus.

A description of a prefabricated greenhouse constructed at the Colorado State University and equipped with thermostatically controlled heating and cooling systems.

177. CARPENTER, G. A., AND MOULSLEY, L. J.
The artificial illumination of environmental control chambers for plant growth. [French and German summaries 21 lines each.]
J. agric. Engng Res., 1960, **5**: 283-306, bibl. 40, illus.

The factors are discussed which affect the spatial distribution of light intensity, control of light intensity with time, and the maximum obtainable light intensity in a cubical cabinet illuminated by fluorescent tubes.—N.I.A.E., Silsoe.

178. SIROHI, G. S., AND HAMNER, K. C.
Automatic device for controlling lengths of light and dark periods in cycles of any desired duration.
Plant Physiol., 1960, **35**: 276-8, bibl. 3.

Made from a 4-drawer steel filing cabinet after removal of 3 drawers.

179. TUKEY, L. D., FLUCK, M. F., AND MARSH, C. R.
An illumination totalizer for integrating light from either natural or artificial sources.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 804-10, bibl. 6, illus.

A description is given of the construction and operation of new type of illumination totalizer, which can be used for both field and laboratory purposes, is portable, easy to handle and cheap to construct.—Pa St. Univ., University Park.

180. WALLIHAN, E. F., AND VANSELOW, A. P.
A system for injecting measured volumes of liquid into soil.
Soil Sci., 1960, **90**: 107-8, illus.

A description and illustrations are given of a system

itable for placement of soluble fertilizer in close
oximity to the roots of established plants. The
stem, which has a high degree of corrosion
sistance, utilizes a 20-gal. supply tank, in which
e solution to be injected is kept under a 50 lb.
essure supplied from a cylinder of compressed
. From the bottom of the tank the solution is
d through a hose to the injection gun, which
nsists of a volume control unit, a 4-way valve
d a hollow probe. The injector was designed to
liver 100 ml. per shot, but it could be made
aller or larger. Detailed drawings are available
om the authors.—Univ. Calif., Riverside.

81. Dedolph, R. R., Basham, C. W., and Stark, F. C.
An exponential sprayer for experimental work.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 785-8, bibl. 2, illus.

description and diagrams are given of a sprayer
nstructed to facilitate the screening of chemicals
determine the effective range of concentration.
ne machine operates on a principle of continual
lution; a constant volume of spray material is
plied, but the concentration of chemical in the
ray material is decreased exponentially.—Univ.
d, College Park.

82. Dedolph, R. R.
A suggested method for handling data obtained with an exponential (variable dosage) sprayer.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 789-98, bibl. 6.

ata from plots sprayed with an exponential
rayer [see previous abstract] can be handled
atistically if the observations are *essentially*
dependent. The validity of the analyses is con-
derably enhanced by sufficient replication, ran-
mization of the direction of spray run, and
reful scrutiny of the data prior to analysis.
onsideration of the confidence limits on a response
rve indicates that the worker should adjust the
itial concentration, so that the concentration
nge most likely to be of interest will be about the
idpoint of the spray run or slightly beyond.
uthor's summary.]—Univ. Md, College Park.

Greenhouses and frames.

(*See also* 147, 171, 176, 594, 1061, 1664.)

83. Revue Horticole Suisse.
[**Modern glasshouses.**] (In French.)
Rev. hort. suisse, 1960, Vol. **33**, No. 10, pp. 282-302, and 306-25, illus.

lmost the whole of this number of the journal
concerned with glasshouses. The subjects of the
articles include: mist propagation, glasshouse
nstruction, automatic ventilation and heating,
ames, glasshouse irrigation and lighting.

184. Massey, P. H., Jr., Marshall, M., and Wilkins, L. B.
Plastic greenhouses.
Circ. Va Polytech. Inst. agric. Ext. Serv. **760**, revised 1960, pp. 8, illus.

Costs, constructional details with diagrams, and heating and ventilation equipment for temporary houses.

185. Bigot, J.
Serres en matière plastique. (**Plastic greenhouses.**)
Rev. hort. Paris, 1960, **132**: 2234-7, illus.

Advantages, construction and operation.

186. McElwee, E. W., and Sheehan, T. J.
Plastic films for temporary greenhouses in Florida.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 364-6, illus.

Mylar was the most durable of the plastics tested. Dirt accumulation on the plastics was great, but, although reduction of light transmission was high (up to 36%), it had no effect on plant growth.—Fla agric. Exp. Stat., Gainesville.

187. Whittle, R. M., and Lawrence, W. J. C.
The climatology of glasshouses. IV. Soil temperature. [French and German summaries 8 lines each.]
J. agric. Engng Res., 1960, **5**: 235-40, bibl. 3.

Soil temperatures in glasshouses differing in orientation, with and without tomato crops, were measured during a period of 5 years. Winter temperatures and the heat gain were consistently higher in an east-west house than in a north-south house. [For part III, see *H.A.*, 30: 4807).—John Innes Inst., Bayfordbury, Hertford.

188. Brun, R., and du Quaillard, H.
Le chauffage temporaire dans les serres. (**Temporary heating in glasshouses.**)
Rev. hort. Paris, 1960, **132**: 2261-5, illus.

Infra-red lamps and propane heaters both gave very profitable results when used at night from late March to late April in glasshouses planted with green peppers and cucumbers. The slight superiority of the infra-red lamps was attributed to their emission of light as well as heat.—Serv. agric., Foyer Progr. agric., Hyères.

189. Sheard, G. F.
Developments in heating and ventilating glasshouses.
Progr. Rep. exp. Husb. Fms and exp. Hort. Stats, 1960, pp. 17-20, bibl. 3.

The author discusses some factors affecting temperature distribution in glasshouses, which have been studied during the commercial evaluation of heating systems (including ventilation) at the Experimental Horticulture Stations and the N.I.A.E. It is considered that some of the developments, in particular the use of low pressure steam injectors, pipe layout, increased accuracy of control and automatic ventilation, can be used to improve existing 4-in. systems.—Glassh. Crops Res. Inst., Littlehampton.

190. Anon.
Roof truss makes its debut in Worthing fan and pad houses.
Comm. Gr, 1960, No. 3380, pp. 781-2, illus.

A new truss design, offering the minimum obstruction to light infiltration, has been incorporated in 2 blocks of clear span houses, which are also automatically ventilated and cooled by the fan and pad method. Carnations and year-round chrysanthemums are to be grown in the houses.

191. Will, H.
Untersuchungsergebnisse und Beobachtungen in der Wanderkastentreiberei. (**Experimental results obtained in mobile frames.**)
Rhein. Mschr. Obstb., 1960, **48**: 9-10, from abstr. in *InformDienst Weihenstephan*, 1960, No. 6, p. 89.

The author obtained approximately 14 and 8 DM gross and net profits respectively per sq. m. of mobile frame. These results are more favourable than those obtained in glasshouse culture.

192. Pinet, M.
Le chassis-serre Pinet. (**The Pinet frame.**)
Rev. hort. Paris, 1960, **132**: 2238-9, illus.

Designed for ease of operation and shaped to permit much more upright growth than usual, it is claimed that 100 sq.m. of these frames can be opened up in 40 seconds or dismantled completely for mechanical soil cultivation in 4 minutes.

193. Lekve, O.
Das mechanisierte Frühbeet "MF 56" und seine gemüsebauliche Eignung. (**The mechanized forcing frame MF 56 and its suitability for vegetable growing.**) [Russian and English summaries ¼ p. each.]
Arch. Gartenb.,1960, **8**: 323-67, bibl. 72, illus.

The double-span frames recommended have sliding Dutch lights, ridge- and side-wall ventilation, central sprinkler irrigation and steam soil heating by means of drain pipes. Those of similar general construction but with only sectional or no side-wall ventilation were less satisfactory in preliminary trials with tomato seedlings and melons. Ordinary glass was a better material than glass bricks for the side walls in tests with lettuces; wood cement was unsatisfactory. Yield and quality of kohlrabi, radishes and lettuces were higher with soil heating from both sides of the frame than from one side only. The steam pipes were also used for soil sterilization, which satisfactorily prevented weed growth and infection by *Bremia lactucae* and *Cladosporium cucumerinum*. In most of the tests the frame proved superior to the standard type in common use in Germany.—Inst. Gemüseb., Grossbeeren.

194. Brun, R., and du Quaillard, H.
L'amélioration de la production des plants maraîchers par le chauffage d'ambiance. (**Improving the production of market-garden crops by heating the air.**)
Rev. hort. Paris, 1960, **132**: 2266-8, illus.

An uncovered section of a large frame containing germinating melon seeds was fitted with 2 parallel tubes, electrically heated and thermostatically controlled at 25° C. during the last 11 nights of March and at 20° C. during the first 11 nights of April. The seedlings in the heated section were more vigorous, and less checked by transplanting, than those in a glass-covered section, and harvesting was advanced by 4–5 days. The installation is described and details of the cost are given. The same apparatus could be used for raising cucumber and tomato plants.—Serv. agric., Foyer Progr. agric., Hyères.

TEMPERATE TREE FRUITS.

General.

(*See also* 161, 1635, 1639, 1646, 1683.)

195. Rumbeke-Beitem (Westvlaamse Proeftuin).
Jaarverslagen Westvlaamse Proeftuin, Rumbeke-Beitem, 1957 en 1958. (**Annual Reports of the West Flanders Experimental Garden, Rumbeke-Beitem, Belgium, for 1957 and 1958**), pp. 58, illus., [received 1960].

Research results for 1957 showed that Tuzet sprays improved fruit colour generally, reduced the size of Cox fruits, but increased size of Belle de Boskoop; total yields of Jonathan during 11 years of a rootstock trial were highest on M.XII and M.I (the effect of rootstock on fruit colour and mildew susceptibility was also studied); a report on the condition of several frameworked apples is given. The 1958 results reported include the following: in soil management trials apple yields were significantly higher in a grass/clover mixture than in clean cultivation, but no soil management system significantly affected the growth of apple or pear trees; Tuzet accelerated maturity and reduced cracking of Ruth Gerstetter plums, although fruit size was also reduced; parathion sprays applied to apples at petal-fall and June drop resulted in the highest yields but also in more russeted fruits. The behaviour of several pear and apple varieties in cold storage is reported, and observations on pear tree growth and production when given wind protection are tabulated.

196. Grochowski, J., and Krzemiński, A.
Wycena drzew i krzewów owocowych. **(Evaluation of soft fruits and fruit trees.)** [English and Russian summaries ½ p. each.]
Prace Inst. Sadown., Skierniewice, 1959, **4**: 159-72, bibl. 3.

A method of estimating the capital value of orchards under Polish conditions.

197. Baldini, E.
Prospettive di sviluppo per l'ortofrutticoltura nella collina imolese. (**Prospects for the development of vegetable and fruit growing in the uplands of Imola.**)
Riv. Ortoflorofruttic. ital., 1960, **44**: 215-26, illus.

Special reference is made to means of improving production of apricots and plums, possibilities of extending bush-fruit growing, seed production and selection in vegetables, and problems of strawberry growing.—Ist. Coltiv. arbor., Univ. Bologna.

198. Zucchini, M.
Peschicoltura italiana. (**Peach growing in Italy.**)
Progr. agric., 1960, **6**: 804-7, illus.

The present situation reviewed.

199. de Haas, P. G., and Hildebrandt, W.
Über den Süsskirschenanbau in Westdeutschland. (**Sweet cherry production in West Germany.**)
ErwObstb., 1960, **2**: 187-91, bibl. 5.

Production figures, distribution and prospects.

200. Motovilov, B. A.
An experiment on fig growing in Krasnodar. [Russian, with English summary ¼ p.]
Subtrop. Kul'tury, 1959, No. 2, pp. 58-63, bibl. 6, illus.

Covering the trees in winter with earth and vegetation has enabled certain varieties of fig to grow and bear reasonable crops in the Kuban in spite of winter temperatures of −25 to −37° C. Cutting back the shoots 15–20 days before the beginning of ripening advanced ripening and increased the percentage of ripe fruits.

201. Guseva, E. P.
Orchard in the desert. [Russian.]
Sadovodstvo, 1960, No. 5, pp. 13-16, illus.

Trials of figs, pomegranates, persimmons and almonds in the hot, dry regions in the south west of the Turkmen Republic are reported. With a temperature range of −14° to +48° C., in saline soils and under conditions of low soil moisture these crops flowered and fruited satisfactorily. Figs produced up to 67 centners/ha., almonds 14 centners/ha. and pomegranates 136·8 centners/ha.

Breeding and varieties.

(*See also* 246, 357, 358, 1658.)

202. Morettini, A.
Il miglioramento genetico degli alberi da frutto e sue recenti acquisizioni in Italia. (**Genetical improvement of fruit trees and its recent achievements in Italy.**)
Frutticoltura, 1960, **22**: 309-25, illus.

A review of methods and new Italian varieties of vines, peaches, pears, plums and cherries.

203. Lalatta, F.
Il miglioramento varietale del melo. (**The breeding of apple varieties.**)
Progr. agric., 1960, **6**: 685-92, illus.

A review of aims and methods in Italy.

204. Murawski, H.
Beiträge zur Züchtungsforschung beim Apfel. V. Phänologische, morphologische und genetische Studien an Nachkommen aus Kreuzungen der Ananas-Renette mit sieben Kultursorten. (**Research in apple breeding. V. Phenological, morphological and genetical studies of progeny from crosses of Ananas-Renette with seven other cultivated varieties.**)
Züchter, 1960, **30**: 134-47, bibl. 20.

For part IV see *H.A.*, 29: 2098.

205. Uitterlinden, L.
Ervaringen met Stark Earliest. (**Experience with Stark Earliest.**)
Fruitteelt, 1960, **50**: 1150-1, illus.

Observations on growth and fruiting of Stark Earliest on M. IX, M. IV, and M. VII are recorded for the first 5 years after planting at Numansdorp.

206. Devjatov, A. S.
Some forms of apetalous apples. [Russian.]
Bot. Žurnal, 1959, **44**: 1653-7, bibl. 6, illus.

The flowers, fruit and seeds of different forms are described and illustrated. The flowers typically have 3 or more whorls of calyx segments and 3 or more sets of ovules yielding multilocular fruits. The flowers were self-sterile, and even with cross-pollination only 2·9% of the flowers set fruit, instead of the 4–5% set obtained with normal varieties.

207. Terpó, A.
Magyarország vadkörtéi. (**The wild pears of Hungary.**) [Russian and German summaries 3½ pp. each.]
Kert. szől. Főisk. Évk., 1958 (issued 1960), **22** (6 part 1): 3-258, bibl. 144, illus.

Origin, systematics, distribution and descriptions of species.

208. Rejman, A., and others.
Wstępne wyniki z sadu odmianowego grusz w Dąbrowicach. (**Preliminary results of the pear variety trials at Dabrowice.**) [English and Russian summaries, 1¼ pp. each.]
Prace Inst. Sadown., Skierniewice, 1959, **4**: 3-21, bibl. 16.
Data on hardiness and yields of 30 varieties.

209. North-Smith, G.
A survey of perry pears in the West Midlands: III. North Gloucestershire.
A.R. Long Ashton agric. hort. Res. Stat., 1959, 1960, pp. 68-70, bibl. 10.
Forty-seven names or synonyms and their distribution. [For part II, see *H.A.*, 30: 142.]

210. Williams, R. R., and North-Smith, G.
Perry pears and their characters: IV.
A.R. Long Ashton agric. hort. Res. Stat., 1959, 1960, pp. 71-7, bibl. 3, illus.
A further 9 varieties from Gloucestershire and Herefordshire described and illustrated. [For part III, see *H.A.*, 30: 143.]

211. Lamb, R. C.
Resistance to fire blight of pear varieties.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 85-8, bibl. 2.
Tabulated data are presented on the resistance of 51 pear varieties to *Erwinia amylovora*, on the basis of a 4-year study. The most resistant varieties, with the possible exception of Waite, are of relatively poor quality, but may serve as a source of resistance in breeding programmes.—N.Y. St. agric. Exp. Stat.

212. Morettini, A.
Butirra rosata Morettini (incrocio Coscia × B. Clairgeau). (**The pear variety Butirra rosata Morettini, a hybrid of Coscia × Beurré Clairgeau.**)
Ital. agric., 1960, **97**: 805-10, illus.
Detailed description of this new early pear.

213. (Burchell, I.)
Nectarines for canning.
West. Fruit Gr, 1960, **14**(5): 27.
Rose and Marigold suitable for canning, freezing and shipping.

214. Fogle, H. W.
The peach variety situation in the Pacific Northwest.
Proc. Wash. St. hort. Ass., 1959, pp. 52-5.
A survey of new varieties available for planting to extend the picking season.

215. Pieniążek, S. A., and others.
Wstępne wyniki z sadu odmianowego śliw w Dąbrowicach. (**Plum and prune variety trials at Dąbrowice.**) [English and Russian summaries 1 p. each.]
Prace Inst. Sadown., Skierniewice, 1959, **4**: 22-40, bibl. 12.
Data on hardiness and yields of 20 varieties.

216. Čhaidze, I. I., and Kvačantiradze, A. H.
Results of fig variety trials in Georgia and in the Ukraine. [Russian, with English summary ⅓ p.]
Subtrop. Kul'tury, 1959, No. 3, pp. 81-6, illus.
In Georgia figs are grown on short stems in bush form and in the southern and western Ukraine in prostrate form with winter covering. In Georgia the main crop is produced on the current year's growth in the autumn, whereas in the Ukraine only the early-set fruit on the previous year's growth usually has time to mature. The highest yields, 18 tons per ha., were produced by the variety Mouissonne at Anaseuli in Western Georgia; at other places good varieties averaged 6 to 12 tons per ha. The best flavoured varieties in Georgia included Mouissonne, Kadota and Lardaro.

217. Basso, M.
Contributo allo studio delle cultivar di fico della Provincia de Pisa. (**A contribution to the study of fig varieties in the province of Pisa.**) [English and French summaries 9 and 10 lines.]
Riv. Ortoflorofruttic. ital., 1960, **44**: 46-66, bibl. 14, illus.
Short descriptions are given of the botanical, morphological and horticultural characteristics of 6 two-crop and 8 one-crop varieties, mostly ripening during September, though the fruits of the S. Martino variety can be left on the tree till Christmas. Of the varieties described Dottato, Verdino, Gentile bianco and Piombinese give the best quality figs, and Dottato and Piombinese are the most suitable for drying.—Ist. Colt. arbor., Univ. Pisa.

Propagation and rootstocks.

(*See also* 170, 195, 261, 286, 478, 484, 499, 507, 1038, 1176.)

218. Scaramuzzi, F.
Alcuni aspetti della propagazione degli alberi da frutto. (**Some aspects of fruit tree propagation.**)
Frutticoltura, 1960, **22**: 345-55.
A general article, dealing with propagation from seed, cuttings and suckers, and with various categories of rootstocks for budding and grafting.

219. Lakshmanan, V.
Anatomy of stionic incompatibility. A review.
South Indian Hort., 1958, **6**: 8-16, bibl. 19.

Concerning callus growth, cambial activity and structural weaknesses of incompatible stock-scion combinations in fruit trees.

220. Breviglieri, N.
Portinnesti e varietà pregiate in frutticoltura. **(Rootstocks for the best varieties in fruit growing.)**
Frutticoltura, 1960, **22**: 357-85, illus.

The points discussed include: the evaluation and selection of propagating material; modern systems of training and intensive cultivation; the choice of rootstocks, seedling and clonal; work done in various European countries on stock-scion compatibility. Annotated lists are given of rootstocks for peaches, plums, cherries, apricots, pears and apples, with special reference to Malling and Malling-Merton types.—Ist. Colt. arbor., Univ. Firenze.

221. Palocsay, R.
Un metodo per la moltiplicazione su radici proprie degli alberi da frutto in "stadio giovanile". **(A method of propagating juvenile fruit trees on their own roots.)**
Riv. Ortoflorofruttic. ital., 1960, **44**: 227-30, illus.

The taproots of 4–5-leaved seedlings are shortened and the seedlings are transferred to pots in a cool glasshouse (8–10° C.), where they are later repotted after a second shortening of the taproots. The atmosphere is kept moist, and after 2 more weeks the ventilation is gradually increased. In early summer the seedlings are planted out on ridges. The soil is gradually removed during the season to induce bud formation on successive roots. On those species such as cherries which do not produce adventitious buds, budding of the roots is carried out in August. In mid-October the roots, whether naturally or artificially budded, are severed at their point of emission and the soil ridges are replaced. The following March the main stem is cut back to a half or a third of its length, depending on the number of roots severed, and after the risk of spring frost has passed, the severed ends of the roots are exposed and pushed gently outward from the mother plant to produce shoots. For success with walnuts, a small piece of the parent axis should be left on each severed root.—Hort. vitic. exp. Stat., Cluj, Romania.

222. Zatykó, J.
Gyümölcsfa alanyok és nemes gyümölcsfajták dugványgyökereztetése szintetikus auxinokkal és szövet-átültetéssel. **(The rooting of cuttings of fruit tree rootstock and scion varieties with the aid of synthetic growth substances and tissue transplantation.)** [Russian and German summaries ½ p. each.]
Kísérl. Közlem., Sect. C, 1959, **52C(2)**: 55-73, bibl. 17, illus.

In field experiments NAA treatment of cuttings of the apple rootstocks M.II, IV, X, XI, XIII and XVI, and the pear rootstocks Quinces A, B and C and some other kinds of quince, was not uniformly effective. Splitting the base of the cuttings generally increased the rooting response to NAA. In glasshouse experiments soaking the base of quince cuttings for 24 hours in NAA at 50 p.p.m. was the most effective treatment, and repeated vacuum infiltration also gave good results. Ringing the shoots of *Prunus mabaleb* and subsequent treatment of cuttings with NAA at 50 p.p.m. resulted in good rooting. Preliminary trials have shown that grafting a bark ring of a quince onto pear shoots induces rooting in cuttings taken subsequently.

223. van Doesburg, H. H., and Douglas, J.
Vermeerderingsproeven met houtige gewassen op het Instituut voor de Veredeling van Tuinbouwgewassen te Wageningen. **(Propagation of woody plants at the Institute of Horticultural Plant Breeding, Wageningen.)** Snelle vermeerdering door wortelenten. **(Rapid propagation by root grafts.)**
Jaarb. Proefst. Boomkw. Boskoop, 1959, pp. 47-51, illus., and pp. 51-4, illus.

The results with winter-stored cuttings of M.IX apple and St. Julien A, Brompton and Marianne plums are described. All cuttings originating from plants on sandy soil rooted better than those from a heavy soil. The use of hormones markedly improved the rooting of Brompton rootstocks. Mist propagation of *Prunus incisa compacta* and *P. kurilensis* was most successful. In the second paper 3 types of root grafting are described, which have been used in propagating some Malling apple rootstocks.

224. Peters, A.
Proeven op de Proeftuin "Boom en Vrucht". **(Trials in the Experimental Garden "Boom en Vrucht".)**
Jaarb. Proefst. Boomkw. Boskoop, 1959, pp. 55-6.

After winter storage rooting of Brompton plum cuttings was best from basal wood. Cuttings from budded apple stocks showed variable rooting, but the highest rooting percentages were obtained from M.I.

225. Černenko, E. S.
The biological characteristics of apple trees propagated from different plant tissues. [Russian.]
Doklady Akad. Nauk, S.S.S.R., 1960, **132**: 474-7, bibl. 9, illus.

Shoots taken in August from root cuttings planted out in May of the same year behaved differently from shoots from the upper part of the crown of the tree when used as grafts. A greater percentage of the crown shoots made successful grafts, and the resulting trees were taller up to 4 years of age, than those from root cutting shoots. Trees from root cutting shoots branched more vigorously during the first and second years, started to flower later and, during the early years of bearing, produced smaller fruit than trees from crown shoot grafts.

226. NESTEROV, JA. S.
The effects of vegetative propagation on fruit shape in apples. [Russian.]
Agrobiologija, 1960, No. 2, pp. 294-6, bibl. 1, illus.

Details are given of the morphological and biochemical changes induced by different rootstocks in the fruit and foliage of hybrid apple seedlings. Seedling No. 4 grafted on a pear rootstock or in the crown of a bearing pear tree developed pear-shaped fruits with long stalks.

227. KEMMER, E.
Mutterbaumkörung und Ertrag beim Apfel. (**The selection of mother trees in relation to apple yields.**)
ErwObstb., 1960, **2**: 160-3, bibl. 4.

In long-term experiments with 142 apple trees, propagated by scions from the same Boskoop tree and worked on two types of seedling rootstock, it was shown that the factor "yield" is not transmitted from the mother tree to its progeny. The rootstock, however, was found to have a distinct effect on yields.—Inst. Obstb., tech. Univ., Berlin.

228. ROY, P.-O.
Le porte-greffe en pomiculture: influence sur le rendement de la variété McIntosh. (**Rootstocks in apple growing: their effects on yield of the variety McIntosh.**)
Agriculture, Québec, 1960, **17**: 40-2.

The frost susceptibility of McIntosh apple trees was greatly reduced or even eliminated by using interstocks of the varieties Hibernal and Robusta No. 5, both of which considerably increased yields. Antonovka, highly compatible with McIntosh, had the disadvantage of producing very large trees which were retarded 3–4 years in bearing. Garnet crab had a slight retarding effect and showed a tendency to dwarfing. Virginia crab was undependable and is suspected of being a virus carrier.

229. CLINE, R. A.
Studies on the interrelationships between mineral nutrition and the physiological and morphological dwarfing response of *Malus domestica* Borkh.
Diss. Abstr., 1960, **21**: 14, being *L.C. Card No. Mic.* 60–2193 of 192 pp.

There was little difference between growth rates, leaf composition, or the translocation and accumulation of Rb^{86} or P^{32} in Starking Delicious scions grafted on a wide range of dwarfing rootstocks. The number of fruits produced in the second growing season, however, was markedly influenced by rootstocks. Growth rate, fruiting and leaf composition of scions on M.II and M.VII in the field differed significantly from those on Western Seedling, but there were no differences between the Malling stocks. When dwarfing materials were used as interstocks, there were significant differences in tree growth, fruiting and leaf N, P, K, Ca and Mg which could be related to the scion and interstock varieties, but not necessarily to the rootstock. Simple correlation coefficients determined between these elements and the various measurements of growth and fruiting were either not significant or not consistent. When multiple correlation coefficients were determined between these nutrients and all measurements of growth and fruiting, high levels of correlation were noted. The results indicate that there is a significant relationship between nutrition and dwarfing both as a growth and as a fruiting response, but that growth and fruiting do not appear to be directly related. The expression of dwarfing by a plant material as a rootstock may be influenced by both the quantity and availability of nutrients to the rootstock. Nutrient concentration may influence growth rate but has very little effect on precocity. —Purdue Univ.

230. ROBERTS, A. N.
Tree size, number and bearing habit determine per acre yields with growth-controlling rootstocks.
Proc. Wash. St. hort. Ass., 1959, pp. 48-51.

Golden Delicious and Red Delicious on M.IX rootstock planted as hedges at 8 × 15 ft. gave greater early yields than, and almost double the total yields (first 12 years) per acre of, trees on M.VII, M.XVI, a combination planting of M.XVI, M.VII and M.IX or trees on M.XVI with Clark's Dwarf interstock. The latter combination produced trees intermediate in vigour between the dwarfing M.IX and the semi-dwarfing M.VII, and deserve further investigation. Trees on M.IX and M.VII were markedly biennial.—Ore. St. Coll., Corvallis.

231. DVOŘÁK, A.
Zkušenosti s odstraňováním střídavé plodnosti u jabloní. (**Experiments on the control of biennial bearing in apples.**) [Russian and German summaries ½ p. each.]
Acta Univ. Agric., Brno, Ser. A, 1959, Special No., pp. 95-9, bibl. 5.

Biennial bearing was controlled by pruning, manuring and in some cases by choice of rootstocks. Thus Berlepsch Reinette and Laxton's Superb on fairly vigorous rootstocks such as M.I, II and XI are biennial bearers, whereas on M.IX as spindle bushes they crop regularly.

232. Vasil'čenko, G. V.
The drought resistance of the Siberian apple used as rootstock. [Russian.]
Fiziol. Rast., 1960, **7**: 481-3, bibl. 9.

A comparison was made between the wild Siberian apple (*Malus pallasiana*), local garden forms of *M. baccata*, reinettes belonging to the garden forms, the forest apple (*M. silvestris*), the Chinese apple (*M. prunifolia*) and seedlings of 2 cultivated varieties of *M. domestica*. Root distribution, top: root ratio, regrowth after drought, water retention, transpiration and frost resistance of the roots were studied. It is concluded that the Siberian apple and the garden forms of *M. baccata* are sufficiently drought-resistant rootstocks for the steppe regions of Siberia and Northern Kazahstan. [See also *H.A.*, 29: 3309x.]—Altai Fruit exp. Stat., Barnaul.

233. Schmidle, A.
Prüfung einiger Apfelstammbildner auf ihre Anfälligkeit für die Kragenfäule (*Phytophthora cactorum* (Leb. et Cohn) Schroet). **(Testing apple stem builders for their susceptibility to collar rot.)**
ErwObstb., 1960, **2**: 169-71, bibl. 14.

The tests were made on young trees of several varieties on a large number of intermediate stems worked on known rootstocks. No tested stem proved immune, but considerable variation in susceptibility was found, the degree of variation being influenced by the rootstock. Maunzen proved outstandingly most resistant, with Peasgood and Danziger Kant runners up; on all these the necroses induced by the fungus were inconsiderable and in some cases cleared up gradually. The fact that Maunzen has also been proved notably frost-resistant suggests the possibility of extending its use as an intermediate.—Inst. Obstkrankh. der biol. Bundesanst. Land- u. Forstw., Heidelberg.

234. Campbell, A. I.
Apomictic seedling rootstocks for apples; progress report II.
A.R. Long Ashton agric. hort. Res. Stat., 1959, 1960, pp. 50-6, bibl. 2, illus.

Three representative English dessert varieties were observed for 3 years in the nursery and 4 years in the orchard on apomictic seedlings of *Malus sikkimensis* and *M. toringoides* and on Malling II rootstocks [for an earlier report, see *H.A.*, 25: 134]. Cox proved vigorous on *M. sikkimensis* and very vigorous on *M. toringoides*; it fruited early on both stocks and the crop was heavier than on M.II. Worcester and Lambourne made dwarf or semi-dwarf trees on the seedlings. Worcester crops were lighter and Lambourne crops heavier on the seedlings. Nursery trials showed that a wide range of varieties made vigorous trees on both *M. sikkimensis* and *M. toringoides* and were as uniform as those on some clonal stocks.

235. Scaramuzzi, F.
Alcune osservazioni sul potere rizogeno delle talee. **(Some observations on the rooting ability of cuttings.)** [English summary 4 lines.]
Riv. Ortoflorofruttic. ital., 1960, **44**: 187-93, bibl. 3, illus.

Cuttings of the pear variety Santa Maria and the quince variety Gigante di Vrania produced no roots, but those of the quince variety Lépage E rooted readily. Santa Maria shoots grafted at their bases with a ring of bark from Lépage E and subsequently used as cuttings rooted freely, but from the region of the grafted bark only. Lépage E shoots, similarly treated with bark from either of the other 2 varieties, rooted after severance, but always above the graft, i.e. from their own tissues. The results agree closely with those obtained by other workers with citrus and olive cuttings. Thus, the rooting capacity of cuttings appears to depend on the nature of the bark tissues rather than on the translocation of possible rhizogenous substances elaborated in the leaves.—Ist. Coltiv. arbor., Univ. Pisa.

236. Hartmann, H. T., Griggs, W. H., and Hansen, C. J.
Old Home pear rootstock propagated by hardwood cuttings.
Calif. Agric., 1960, **14**(10): 9-10, illus.

Cuttings taken in the middle of November, treated with 200 p.p.m. IBA and kept in damp peat moss at 65° F. for 3 weeks prior to planting, gave the best results, 53% rooting [see also *H.A.*, 29: 98]. Rooting was poorer when the cuttings were collected in December or January, and when 100 or 300 p.p.m. IBA was used. The basal ½-inch of the cuttings was soaked in the IBA for 24 hr.—Univ. Calif., Davis.

237. Pisani, P. L.
Alcune osservazioni comparative sulla tecnica dell'innesto a "doppio scudo". **(Some comparative observations on the technique of double-shield budding.)**
Riv. Ortoflorofruttic. ital., 1960, **44**: 209-14, bibl. 15, illus.

Garner's method of double-shield budding with a short intermediate shield [*H.A.*, 23: 2548] was compared with Nicolin's method (full length intermediate) [*H.A.*, 23: 3813] in working Williams' pear on quince, with Beurré Hardy as the interstock. The results were equally good with either method, but Nicolin's method was simpler and more rapid in practice.—Cent. Miglior. Piante Frutto C.N.R., Firenze.

238. Blodgett, E. C., Aichele, M. D., and Parsons, J. L.
Overgrowth of French rootstock under Bartlett pear trees.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 89-92, bibl. 8, illus.

The presence of an overgrowth of the stock under Bartlett is not unfailing proof that the understock is of French origin. There is evidence, however, that a high proportion of these overgrowths indicate French roots. Bartlett on the oriental rootstock shows little or no overgrowth at the union. [Authors' conclusions.]—Wash. agric. Exp. Stats.

239. Blodgett, E. C.
Observations on pear decline in 1959.
Proc. Wash. St. hort. Ass., 1959, pp. 85-6.

Some twenty 1- or 2-year-old experimental Bartlett, Anjou and Hardy trees, growing vigorously, suddenly wilted and died in August and September. These were all on *Pyrus ussuriensis* or *P. serotina* stocks; no trees on Bartlett, French or Calleryana seedling roots wilted.—Wash. agric. Exp. Stats.

240. Griggs, W. H., and Hartmann, H. T.
Old Home pear trees show resistance to decline when on own roots.
Calif. Agric., 1960, **14**(10): 8, 10, illus.

Observations have shown that pear trees do not suffer decline when a root system develops from the Old Home intermediate stock.

241. Douglas, J.
Onderzoek over onderstammen. (**Rootstock research.**)
Fruitteelt, 1960, **50**: 900-1, 903, illus.

Progress in the selection of dwarfing pear and cherry rootstocks at the I.V.T., Wageningen.

242. Nekrasova, T. V.
The effect of gibberellic acid on seed germination and seedling growth of fruit trees. [Russian.]
Fiziol. Rast., 1960, **7**: 106-9, bibl. 18, illus.

Cherry seeds were soaked in 0·02% GA for 48 hours, and peach, apricot and sour cherry seeds for 24 hours. The treatment had no effect on the germination of unstratified seeds from which the whole seed coat was not removed but advanced germination by 3–4 days in peach and sour cherry seeds from which the whole seed coat was removed. Pre-sowing treatment with GA improved early seedling growth, but later its favourable effect was only observed in one peach variety.

243. Stahly, E. A.
Auxin levels of developing Halehaven peach ovules.
Diss. Abstr., 1960, **21**: 19, being *L.C. Card No. Mic.* 60-2280 of 45 pp.

Auxin trends during 1955, a "dry" year, were similar to those found in 1957, a "normal" year, but the highest auxin levels of 1955 were only about half those found in 1957. Auxin II (Rf 0·15 to 0·45) was highest during rapid endosperm development, at pit hardening. The highest levels of auxin III (Rf 0·65 to 1·0) occurred during rapid embryo development. The high auxin levels at these stages suggest that the slower rate of mesocarp growth associated with them may be the result of inhibiting auxin levels.—Univ. Md.

244. Flemion, F., and de Silva, D. S.
Bioassay and biochemical studies of extracts of peach seeds in various stages of dormancy.
Contr. Boyce Thompson Inst., 1960, **20**: 365-79, bibl. 33, illus.

Methanolic extracts of peach seeds contained both inhibiting and stimulating eluates which travelled to different areas of the chromatogram. From excised peach embryos weakly toxic substances were also obtained. None of these materials caused responses when applied to peach seedlings. Neither naringenin nor naringin affected germination or development when seeds were treated with them. Quantitative studies of various amino acids, organic acids and phosphates present during chilling and germination showed large differences in levels, but it is not known whether these differences indicate that the substances have a primary role in overcoming dormancy.

245. Flemion, F., and Prober, P. L.
Production of peach seedlings from unchilled seeds. I. Effect of nutrients in the absence of cotyledonary tissue.
Contr. Boyce Thompson Inst., 1960, **20**: 409-19, bibl. 28, illus.

A method is described whereby apparently normal seedlings can be obtained from unchilled seeds of a variety of peach which normally require approximately 9 weeks at 5° C. for after-ripening. The excised embryos, from which the cotyledons had been removed, were grown under aseptic conditions on nutrient agar at room temperature. Within 10 to 20 days, after adequate root development had taken place, they were transferred to nutrient culture in the greenhouse where they subsequently produced plants which appeared to be normal [see also *H.A.*, 26: 3338]. Although germination of the ecotyledonized embryos from both chilled and unchilled seeds occurred on the nutrient agar, it was slower and more erratic in the latter. In attempts to overcome this various substances including yeast extract and kinetin were added to the cultures, but none of the substances used affected root or shoot development; likewise the addition of extracts from unchilled seeds did not produce physiological dwarfs. [From authors' summary.]

246. THEOBALD, W. L., AND HOUGH, L. F.
The relationship between stage of peach embryo development and seedling growth and survival.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 163-70, bibl. 18, illus.

Poor development and survival of seedlings of early ripening varieties has been a major obstacle in peach breeding programmes. In tests with 16 genotypes no relationship was observed between seedling survival and embryo germination, shoot emergence or shoot growth. Survival was found o be related to the degree of root growth of the seedlings. Root growth was greatest, and survival consequently highest, when the seed was harvested just before or just as the embryo reached full size. With varieties in which the fruit ripened more than 110 days after full bloom, however, root growth of the seedlings was also good when the seed was harvested at fruit maturity. [See also *H.A.*, 30: 1642.]—Rutgers Univ., New Brunswick, N.J.

247. ZAGAJA, S. W., HOUGH, L. F., AND BAILEY, C. H.
The responses of immature peach embryos to low temperature treatments.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 171-80, bibl. 26, illus.

A series of experiments is reported on the time relationship between fruit ripening and embryo abortion of early ripening peaches and on the after-ripening requirements of cultured immature peach embryos. Embryo abortion of early ripening peaches is associated with softening and senescence of the fruit. Immature peach embryos were found to possess after-ripening requirements similar to those of most mature peach seeds. Stratification decreased contamination in the cultures, improved germination, and improved growth of immature embryos. This treatment was also necessary for the production of adequate numbers of normal seedlings. The best results were obtained when the cultured embryos were stratified for 1 month at 5° C. followed by 4 months at 1° C. Nearly 100% of the seedlings in this treatment were normal, and they were also characterized by superior survival after transplanting. [From authors' summary.]—Rutgers Univ., New Brunswick, N.J.

248. ZAGAJA, S. W., AND HOUGH, L. F.
Survey of amino-acids in acid hydrolysates from embryos of early and late ripening peaches.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 181-7, bibl. 22.

The number of amino-acids detected in the embryos of very early ripening peaches was less than in later ripening ones. Samples taken early in the season showed fewer amino-acids than samples taken later, whether or not fruits were ripe. For the early harvested samples, the number of amino-acids detected was greater in stratified embryos than in corresponding freshly harvested samples. Considerable growth and accumulation of dry matter occurred in the cotyledons of the embryos during stratification. From that it is concluded that embryonic growth takes place in immature peach embryos during stratification. [From authors' summary.]—Rutgers Univ., New Brunswick, N.J.

249. JAUHARI, O. S., AND KOHLI, V. P.
Studies in the propagation of peach by stem cuttings with the aid of growth regulators.
Curr. Sci., 1960, **29**: 282-3, bibl. 2, illus.

Rooting percentages of 60, 75 and 55 were obtained in softwood cuttings treated with β-IBA at 40, 60, and 80 p.p.m. respectively. α-NAA was not so effective, nor were hardwood cuttings.—Govt. agric. Coll., Kanpur.

250. KATZFUSS, M., AND MEIER, G.
Erfharungen mit der Pflaumenunterlage Klon 103 als Unterlage für den Pfirsich. **(Experiments made with the plum rootstock clone 103 as a rootstock for peach.)**
Dtsch. Gartenb., 1960, **7**: 124-5, bibl. 1.

Since the plum rootstock Schwamborn 103 had proved superior to other rootstocks when used for plum varieties, the clone was tested as a rootstock for 3 peach varieties in one year's nursery trials. The preliminary results obtained were promising.—Inst. Obst- u. Gemüseb. Martin-Luther-Univ., Halle (Saale).

251. STRYDOM, D. K., AND HARTMANN, H. T.
Absorption, distribution, and destruction of indoleacetic acid in plum stem cuttings.
Plant Physiol., 1960, **35**: 435-42, bibl. 29, illus.

Cuttings of Marianna 2624 were taken from 2- and 9-year-old trees at various times from June to November and were divided into leafless and leafy classes. All leaves were removed from the former, whereas a single apical leaf was left on the latter. The α-labelled IAA at 4,000 p.p.m. was applied as a dip to the basal 1½ in. or the apical ½ in., and its distribution was determined by radioautographic and counting techniques. No difference was observed in the amount of IAA taken up by leafy and leafless cuttings. At the concentration used the IAA moved in both acropetal and basipetal directions. In leafy cuttings the radioactivity was distributed throughout the entire cutting 24 hr. after treatment. Adventitious roots induced by IAA treatment showed appreciable amounts of radioactivity 28 days after the cuttings were treated. At this time considerable radioactivity was still evident in all parts of the cutting. Cuttings showed detectable amounts of radioactivity in the respiratory CO^2 within 12 hours from treatment. The respiratory CO^2 still showed some radioactivity 30 days after treatment. Tissue slices prepared from plum stem tissue metabolized α-labelled IAA very readily, and appreciable amounts of $C^{14}O^{2}$ were detected within 1 hour after treatment. Homogenates prepared from both intact and autoclaved plum stem tissue showed an apparent destruction of IAA. Peroxidase activity could only be demonstrated in the homogenate obtained from the intact tissue.—Univ. Calif., Davis.

Climatic factors.

(*See also* 200, 201, 208, 215, 228, 232, 270, 299.)

252. ZANON, K.
Erfahrungen und Ergebnisse mit der Frostschutzbewindung in Südtirol. (**Observations on frost protection with fans in the South Tyrol.**)
ErwObstb., 1960, **2**: 150-5, bibl. 9, illus.

Where frost protection of orchards by irrigation was impracticable, fans, in combination with a few heaters, gave good results in certain valleys of the South Tyrol. Conditions for the success of fans are: that the area to be protected is not less than 1·5 hectare; that the site is level or only slightly sloping, or in a narrow valley; and that radiation frosts with temperature inversions normally occur.

253. CRAWFORD, T. V., AND LEONARD, A. S.
Wind machine-orchard heater system for frost protection in deciduous orchards.
Calif. Agric., 1960, **14**(8): 10-13, illus.

A combination of a central, under-tree wind machine with a border of orchard heaters gave a fairly uniform temperature rise over 10 acres of peach orchard [see also *H.A.*, 30: 184]. Larger acreages necessitated more but not larger machines. —Univ. Calif., Davis.

254. GROCHOWSKA, M., GROCHOWSKI, J., AND PIECZARA, J.
Uszkodzenia mrozowe drzew owocowych po zimie 1955–1956 r. (**Frost damage to fruit trees in the 1955-1956 winter.**) [English and Russian summaries 1 and 1¼ pp.]
Prace Inst. Sadown., Skierniewice, 1959, **4**: 173-206, bibl. 17, illus.

A survey of the damage sustained by Polish orchards in this severe winter, which killed 97·7% of the apricots, 90·8% of the peaches, 28·6% of the sweet cherries, 26·5% of the plums, 6·6% of the apples and 6·5% of the pears.

255. PIENIĄŻEK, J., AND WIŚNIEWSKA, J.
Zmiany histologiczne w pędach jabłoni i gruszy na skutek mrozów w zimie 1955-1956 r. (**Histological changes in apple and pear shoots after the severe winter, of 1955-1956.**) [English and Russian summaries 1½ pp. each.]
Prace Inst. Sadown., Skierniewice, 1959, **4**: 215-34, bibl. 9, illus.

Samples of one- and two-year-old wood were taken from a representative series of apple and pear trees in March 1956. The wood of the pear shoots showed the greater discolouration, but this was not related to the extent of frost injury, being due to their greater content of tannin and starch. Changes due to frost injury were found to be irreversible only when intercellular communication was interrupted by severe necrosis of the bark and medullary rays and when more than half the cells were dead and half the vessels occluded.

256. FERKL, F.
L'influence de la température sur les troncs des arbres fruitiers. (**The effects of temperature on the trunks of fruit trees.**)
Rev. hort. suisse, 1960, **33**: 254-8, illus.

This article is a summary of work carried out in Czechoslovakia over many years. Summer and winter injuries to the west and south sides of trunks are described, and a chart shows the temperatures registered in the cambium of a cherry trunk at different points of the compass under sun and shade conditions and after lime washing. Shielding during the winter and early spring with half cylinders of roofing felt on wooden supports is recommended, particularly for stone-fruit trees.

257. WILNER, J., KALBFLEISCH, W., AND MASON, W. J.
Note on two electrolytic methods for determining frost hardiness of fruit trees.
Canad. J. Plant Sci., 1960, **40**: 563-5, bibl. 5, illus.

Comparisons were made between the electrical conductivities of apple shoots as determined by a modification of the method introduced by Filinger and Zeiger [see *H.A.*, 22: 137] and those obtained from tissue diffusates by the authors' method [see *H.A.*, 30: 179]. The two methods gave substantially similar results. The conductivity increased rapidly when the ambient temperature fell below 10° to 0° F., depending on the variety. It remains to ascertain what resistance readings correspond to critical injury.—Canada Dep. Agric., Ottawa.

258. DONOHO, C. W., JR., AND WALKER, D. R.
The effect of controlled temperature treatments on hardiness of Elberta peach trees.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 148-54, bibl. 5.

The electrical conductance of twig samples and survival ratings of 2-year-old dormant Elberta peach trees were measured on 3 occasions during 1956–57 after the trees had been held at various temperatures. The electrical conductance of twigs from cold injured trees was much greater than with uninjured trees. The correlation coefficients of conductance and tree survival were 0·823, 0·789 and 0·793 for December, January and February 1956–57 respectively. The regression slopes were not the same for the three sampling dates. The combined correlation was 0·660. Conductance values progressively increased, while the survival ratings remained approximately the same for a given treatment as the season progressed. Electrical conductance was a good relative measure of cold resistance (hardiness) occurring between treatments measured on a given date. Seasonal conductance values for a given treatment may not be a good indication of actual hardiness throughout the season, since the conductance progressively increased and the survival ratings did not. Electrical conductance of trees moved from 65° to 40° F. decreased slightly after one day and significantly after 7 days. Conversely, the conductance of trees moved from 40° to 65° F. did not change after one day but increased significantly after 7 days. This indicates approximately how fast a peach tree responds to temperature in its ability to gain and lose cold hardiness. [Authors' summary.]—N.C. St. Coll., Raleigh.

259. Donoho, C. W., Jr., and Walker, D. R.
The effect of temperature on certain carbohydrate and nitrogen fractions in the bark and roots of peach trees during the dormant season.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 155-62, bibl. 9.

Bark tissue of 2-year-old peach trees held at 40° and then placed at 65° F. for 7 days during the dormant period decreased in reducing sugar and total sugar. Under these conditions starch increased and the N fractions remained relatively constant. The inverse relationship was observed for the constituents when trees held at 65° were placed at 40° F. for a 7-day period before analysis. All changes in sugar were not associated with changes in starch. A higher correlation coefficient existed between the reducing sugar fraction and the electrical conductance than with the other constituents measured. The higher levels of reducing sugar in the bark resulted in less damage from freezing temperatures than the lower levels. [From authors' summary.]—N.C. St. Coll., Raleigh.

260. Proebsting, E. L., Jr.
A record of Elberta peach fruit bud hardiness during the past five winters.
Proc. Wash. St. hort. Ass., 1959, pp. 106-9.

A continuation of work reported in *H.A.*, 30: 3274.

261. Korejša, Z. I., and Muminov, T. G.
Changes in the growth and development of peach induced by low temperature treatment of the germinating seeds. [Russian.]
Fiziol. Rast., 1960, **7**: 89-91, bibl. 8.

Alternating cold (—1 to 3° C.) and warm (20° C.) treatment of germinating peach seeds greatly improved the frost resistance of the seedlings. During the first 2 growing seasons the growth of the treated plants was somewhat retarded, but in the third they overtook the controls. The sugar, starch, hemicellulose, pentosan, N and P contents were higher in the plants from treated seed.

262. Rjadnova, I. M.
The influence of temperature on the development of flower buds and fruits. [Russian.]
Fiziol. Rast., 1960, **7**: 92-4, bibl. 5, illus.

Brief illustrated descriptions are given of flower and fruit abnormalities, caused by unusually low or high winter temperatures, in apples, pears, quinces, apricots, peaches and sour cherries.

263. Yoshimura, F., and Kawamura, Y.
Influence of winter temperature on the dormancy of some deciduous fruit trees. V. Effect of day temperature during winter on the spring shoot growth of peach and Japanese persimmon trees. [Japanese, with English summary ⅔ p.]
J. hort. Ass. Japan, 1960, **29**: 47-54, bibl. 5, illus.

High day temperatures (8–13° C. above outside air temperature) for various periods in December and January delayed bud opening and reduced the number of shoots on peach trees. Shoot elongation was poor and apical dominance disturbed. The same treatment in late winter, however, hastened spring growth. Low day temperatures (2–4° C. below outside air temperatures) and chilling (—1 to 0° C. for 5–7 days) hastened the breaking of dormancy. In persimmon the high day temperature treatment did not affect bud opening, but the chilling delayed spring growth. [For part III, see *H.A.*, 30: 3275.]

264. Brown, D. S.
The relation of temperature to the growth of apricot flower buds.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 138-47, bibl. 4.

The relationship of temperature to the length of 4 periods in the growth of Royal apricot flower buds is reported. During Period 1, which is the interval from full bloom, through the summer, to the time in the autumn when the rest influence is most intense, bud development is delayed by high minimum temperatures but is comparatively unaffected by variations in maximum temperatures. During Period 2, which is the time during the autumn and early winter when the rest influence is broken, bud development is delayed by high maximum temperatures but is advanced by temperatures in the upper end of the minimum range. At this time the minimum temperatures which are most efficient in promoting bud development are those which are low enough to be effective in breaking the rest, but also high enough to be favourable to growth and to advance bud development as the rest is broken. During Period 3, which occurs in late winter and is the time of transition from the resting to the non-resting condition in the buds, bud development is advanced by temperatures favourable for growth, though temperatures at the lower end of the growing range are more efficient than those at the upper end. Chilling temperatures are necessary to complete the rest-breaking process in Period 3, but bud development is advanced only if the chilling is supplemented with temperatures favourable to growth. The rest influence is broken by the beginning of Period 4, which is the period of very rapid bud development prior to bloom. At this time, the buds are fully responsive to favourable growing temperatures. [Author's summary.]—Univ. Calif., Davis.

265. Tukey, L. D.
Some effects of night temperature on the growth of McIntosh apples, II.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 39-46, bibl. 2, illus.

Branches of McIntosh apple trees were exposed to controlled night temperatures and natural day temperatures for about a month following petal fall. Fruit growth was found to be influenced mainly by night temperature. A night temperature of 73° F. was more favourable for fruit growth than one of 48° or 89°. Night temperatures favourable for fruit growth at night had an inhibiting effect on continued growth during the day. Fruits that failed to enlarge appreciably during the night because of cool night conditions did enlarge during favourable day conditions. The degree of variability of diurnal fruit growth, due to temperature fluctuations, was reduced by warmer night growth conditions. [For part I, see *H.A.*, 27: 2130.]—Pa St. Univ., University Park.

266. Steckel, W.
Über den Einfluss der Temperatur auf den Ertrag beim Apfel. (**The effect of temperature on apple yields.**)
[*Publ.*] *Inst. Obstb. tech. Univ. Berlin* **112**, 1960, pp. 73, bibl. 47.

Experiments were carried out with 40 spindle bushes on M.IX, 36 bush trees on M.II and Pillnitz R.12 and 52 half-standard trees on seedling rootstocks. Varieties which were relatively insensitive to temperature effects were excluded from the trial. The monthly means of the daily average temperatures were determined for the periods March–December of the previous year and January–September of the harvest year, and the results were related to yields. Two methods were used to establish correlations between temperature and yields, and the agreement between them was satisfactory in so far as an evaluation of the months was concerned. The majority of correlations occurred in May and July of the previous year and in February and April of the harvest year. The number of correlations was greater in the harvest year than in the previous year, the majority of the latter being positive and of the former negative. The highest correlation coefficients occurred in May of the previous year and in February, April and May of the harvest year. On the whole, Goldparmäne showed distinctly fewer correlations than other comparable varieties. The effect of soil covering on the number of correlations was demonstrated in the case of Goldparmäne, where 7 correlations occurred in open soil and 12 under sod. The method of pruning had no effect on temperature-yield correlations. The correlation between flowering intensity and yields was very high; it must be assumed that yields are largely determined by the intensity of flowering.

Soil management and irrigation.

(*See also* 146, 163, 195, 266, 280, 400, 1047.)

267. Archibald, J. A.
Orchard soil management.
Publ. Ont. Dep. Agric. **457**, revised 1960, pp. 43, illus.

Systems of soil management are discussed, including the use of cover crops, mulching, sod crops, chemical control of grasses and weeds and the prevention of mouse injury. The macro- and micro-nutrient requirements of fruit trees are dealt with, and physiological disorders associated with nutrition, such as bitter pit and water core of apple, leaf scorch of pear and internal breakdown of peach, are outlined. Methods are described for determining nutritional needs, for fertilizer placement, for subsoiling and for making foliar applications of fertilizers.

268. Bargioni, G.
Il sistema radicale degli alberi da frutto in rapporto alla tecnica colturale. (**The root systems of fruit trees in relation to cultural techniques.**)
Frutticoltura, 1960, **22**: 387-98, illus.

Recent investigations are reviewed, with special reference to the effects of soil profiles and the physical and chemical properties of the profile horizons on the distribution of the roots. Factors governing the choice and preparation of orchard soils, planting density, cultivation, manuring, irrigation, intercropping and mixed cropping are discussed.

269. Pisani, P. L.
Osservazioni sul comportamento del sistema radicale del pesco e sul contenuto idrico del terreno in rapporto alla diversa tecnica colturale. (**Observations on the character of peach root systems and on soil moisture content in relation to different cultural techniques.**)
Riv. Ortoflorofruttic. ital., 1960, **44**: 32-45, bibl. 39, illus.

The treatments in a 3-year investigation on Morettini peaches were: (1) surface cultivation (10-12 cm.) repeated at various intervals as required for the control of grass; (2) uncultivated; (3) uncultivated with straw mulch 8-10 cm. thick. The treatments had a fairly considerable effect on moisture availability. Straw mulch favoured the maintenance of a higher moisture availability for a longer period during the summer (though this effect tended to diminish with the passage of years probably owing to changes in the structure of the upper layers of the soil caused by the suspension of deep cultivation) and the development of numerous fine roots in the uppermost layer of the soil. The presence of a deep sandy stratum below a compact upper horizon favoured greater depth of rooting through better aeration and humidity.—Cent. Miglior. Piante Frutto Orto C.N.R., Firenze.

270. Jabłońska, M., and others.
Wpływ zabiegów agrotechnicznych na rozwój młodych jabłoni. (**The effect of certain cultural treatments on young apple trees.**) [English and Russian summaries 1 p. each.]
Prace Inst. Sadown., Skierniewice, 1959, **4**: 106-29, bibl. 12, illus.

Dwarf trees, variety Bancroft, were given 5 treatments: viz., clean cultivation and heavy dressings of NPK; annual intercropping with oats; clean cultivation and ringing; clean cultivation and severe pruning; clean cultivation as control. The extent and duration of annual growth, blossoming, the quantity and keeping quality of the fruit and the chemical and microscopical characteristics of leaf and shoot were studied. Annual intercropping reduced the seasonal duration of growth, the leaf area, the thickness of the palisade layer, the N content of the leaves and the yield and size of the fruit. It increased the dry matter and carbohydrate contents and the keeping quality of the fruit, and hastened lignification and the cessation of annual growth. Ringing retarded growth, whereas severe pruning enhanced it as well as maintaining yield from fewer fruit buds. Heavy applications of NPK delayed the cessation of annual growth and lignification, increased yield and reduced storage quality but did not decrease winter hardiness.

271. Kuz'menko, G. A.
Controlling chlorosis of fruit trees in the Crimea. [Russian.]
Sadovodstvo, 1960, No. 5, pp. 33-5.

Chlorosis in apples and sweet and sour cherries was much reduced by growing lucerne in the interrows.

272. Bibikova, A. F.
Maintenance of interrows in young irrigated orchards. [Russian.]
Sadovodstvo, 1960, No. 5, pp. 22-4.

Effects on shoot growth of the frequency of irrigation and of cover-cropping with lucerne.

273. Veihmeyer, F. J., and Hendrickson, A. H.
Essentials of irrigation and cultivation of orchards.
Circ. Calif. agric. Exp. Stat. **486**, 1960, pp. 28, illus.

For deciduous fruit trees and citrus.

274. Adamson, R. M., and others.
[Weed control in] horticultural crops. (b) Fruits, flowers and ornamentals.
Res. Rep. west. Sect. nat. Weed Cttee Canada, 1959, pp. 105-12.

Weed control in apples is dealt with by 2 reports, in strawberries by 4, in blackberries and loganberries by one each, and in ornamental trees and shrubs and shelter belts by 2 reports.—From *Weed Abstr.*, **9**, No. 953.

Nutrition and tree composition.

(*See also* 151, 229, 231, 245, 255, 259, 261, 267, 270, 324, 347, 473, 511.)

275. de Vos, N. M., den Dulk, P. R., and Butijn, J.
De verticale verdeling van voedingsstoffen in boomgaarden. (**The vertical distribution of nutrients in orchards.**) [English summary 9 lines.]
Meded. Dir. Tuinb., 1960, **23**: 429-39, bibl. 5.

Samples to determine nutrient status may be taken from the top 20 cm. of river clay orchard soils. On marine clay soils deeper sampling may be necessary, especially when a low Mg content is suspected. Little correlation was found between K and Mg contents in leaves and in soil.—R.T.C., Geldermalsen.

276. Dotti, F.
Stato attuale delle ricerche sulla diagnostica fogliare in frutticoltura. (**The present position of research on foliar diagnosis in fruit crops.**)
Frutticoltura, 1960, **22**: 327-43, bibl. 13, illus.

Values for the major-element contents of plant tissues are much more significant when expressed as mg. atoms per 100 g. of dry weight than as simple percentages. Numerous examples are given of the relationship of foliar N, P and K in peaches to production and manurial treatment. They include depression of K uptake by excess of N. Tables for apples show the effects of differential manuring and of biennial bearing on foliar N, P and K, and work showing the effects of K on fruit quality is quoted. The recent extension of the application of foliar diagnosis to fruit-growing in Italy is discussed.—Ist. Colt. arbor., Univ. Milano.

277. Walker, D. R., and Mason, D. D.
Nutritional status of apple orchards in North Carolina.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 22-31, bibl. 7.

Results of a survey discussed.

278. Société Pomologique de France.
La fertilisation des sols de vergers. (**Fertilization of orchard soils.**)
Pomol. franç., 1960, **2**(5): 5-23, illus.

This special issue is mainly devoted to a recent enquiry by the Pomological Society of France on the fertilization of orchard soils. A summary is given of the responses from the 7 regions studied. The following were among the questions asked: *Climate:* incidence of frosts, whether water supply is a limiting factor. *Orchards:* pure or mixed culture, spacing, relative yields, area per holding. *Soils:* organic and inorganic manuring, time of application of dressings, soil cover, use of trace elements.

279. van der Boon, J.
Bemesting met kunstmest en grondonderzoek in de opengronds fruit- en groenteteelt. (**The application of artificial fertilizers and soil analysis in fruit and vegetable growing in the open.**) [English summary ⅓ p.]
Meded. Dir. Tuinb., 1960, **23**: 279-85, 384-8, 424-8, 439, bibl. 32.

The author discusses the principles of manuring with N, P, K and Mg, and the crop requirements for these nutrients. The relationship between the dosages of the more common fertilizers and the nutrient content of the soil is also examined.—Inst. Bodemvrucht., Groningen.

280. Pouwer, A.
De stikstofbemesting in grasboomgaarden. (**Nitrogen manuring in grassed orchards.**) [English summary ½ p.]
Meded. Dir. Tuinb., 1960, **23**: 376-83, bibl. 9.

Studies of soil analysis methods used to estimate the supply of N in grassed orchard soils made it clear that single determinations of nitrate and ammonium contents were not enough. The total N content of the soil and the C/N ratio of the top 5 cm. are more useful indications of the level of N fertilization. When the C/N ratio is low, much of the N given as fertilizer is available for plant uptake, but with a high C/N ratio some of the N fertilizer is combined with soil organic matter and becomes unavailable. It was shown that N deficiency would appear when the total N content of the soil was 0·2% or less and when the C/N ratio was higher than 15. In a discussion of the N balance in the soil it is shown that where there is rapid formation of organic matter there are only small losses of N; in plots where organic matter is no longer formed only small quantities of N are required for adequate N fertilization of the trees.—R.T.C., Kesteren.

281. Włodek, J., Mrozowski, M., and Gajewski, E.
Doświadczenie nad dolistnym nawożeniem jabłoni i śliw mocznikiem. (**Studies on the foliar nutrition of apple and prune trees with urea.**) [English and Russian summaries ¾ p. each.]
Prace Inst. Sadown., Skierniewice, 1959, **4**: 142-58, bibl. 36.

No effect was obtained by spraying 8-year-old trees of Common Prune or 30-year-old trees of 5 apple varieties, including Cox, with various concentrations of urea at different times.

282. Baldini, E.
La concimazione epigea degli alberi da frutto. Sperimentazione attuale e possibilità applicative. (**Nutrition of fruit trees *via* their aerial parts. Current experimental work and possibilities of its application.**)
Frutticoltura, 1960, **22**: 401-12, illus.

The emphasis of the review is on apple trees, but pears, peaches and cherries are also mentioned. Practical recommendations include the application, after pruning and before bud burst, of 4–8% nutrient solutions to the branches. For vines 4 foliar sprays of 0·5% solutions containing N and K are advised at fortnightly intervals, followed if necessary by 2 containing mainly K towards harvest time. The recommendation for apples is 2 foliar treatments, at petal fall and 20 days later, with NK, and 2 further treatments with NPK.

283. (Kidman, G. J.)
What has the peach fertilizer trial taught us?
J. Agric. Vict., 1960, **58**: 217-19.

The highest yields and the most economic returns were obtained when a mixture of 3 lb. of sulphate of ammonia plus 4 lb. of superphosphate was applied per tree in mid-August [late winter] plus 3 lb. of sulphate of ammonia in January.—Tatura hort. Res. Stat.

284. Chvojka, L., and Babický, A.
Transport of radioactive phosphate in own-rooted and grafted trees after application of P^{32} to the conductive tissue of the roots. [Russian, with English summary ½ p.]
Biol. Plant., Prague, 1960, 2: 98-106, bibl. 8, illus.

After applying radioactive P to thin roots, 5–8 mm. in diameter, of 6–8-year-old grafted apple trees, 5–6-year-old own-rooted apple trees, 4–6-year-old own-rooted plum trees, and 4–6-year-old grafted apricot trees, periodic observations were made of the radioactivity of leaves in tree crowns and of roots. The radioactive P was found in most of the top branches, with most of it concentrated in a few of them. This distribution persisted for at least 2 months. Also, 2 months after exposure radioactive P was found in the roots opposite to where it had been applied. It was found to be transported mainly by a definite part of the trunk xylem, but a small portion was transported horizontally through the trunk. There was no significant difference in transport and localization of P between grafted and own-rooted trees.—Czech. Acad. Sci., Prague.

285. Grognier, M.
La localisation en profondeur de la fumure phospho-potassique. **(K and P application below the soil surface.)**
Fruits et Prim., 1960, **30**: 57-9, illus.

Experiments at the Boufarik research station have shown the great advantage to top fruit production of applying K and P fertilizer by fertilizer lance rather than by surface spreading. The author draws attention to an apparatus drawn by a tractor, which places the fertilizer in lines at a depth of 0–60 cm. This has been successfully tested by the Agronomic Station of Toulouse and by fruit growers in the South West of France and gives excellent results, shown in increased formation of fine roots without any wilting due to severed roots.

286. Liwerant, J.
Rélations entre la chlorose des arbres fruitiers et la réaction des sols. **(The relationship between chlorosis in fruit trees and the soil reaction.)**
C.R. Acad. Agric. Fr., 1960, **46**: 352-8, bibl. 2.

Lime-induced chlorosis is common in the Garonne basin in peach and in pear on quince. Investigations show that on soils with a low active calcium content there is a risk of chlorosis when the pH exceeds 7·7 with peach on seedling rootstocks, 7·9 with peach on plum and 8·1 with pear on quince. Peach and pear on quince should not be planted on soils with an active calcium content above 5%, and the pH should be taken into consideration on soils with an active calcium content below 5%.—Stat. Agron. Oenol., Toulouse.

287. Beutel, J. A., and Morgan, W. C.
Correcting pear chlorosis.
West. Fruit Gr, 1960, **14**(5): 23.

Sprays of organic Fe materials did not correct Fe chlorosis, but soil applications of Geigy 138 chelate ($\frac{1}{2}$–2 lb./tree) or Sta-Green 135 chelate (3–5 lb./tree) turned trees green within 3 months. The higher rates restored fruit production to normal in the second year after application.

288. Fernández, C. E., and Childers, N. F.
Molybdenum deficiency in apple.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 32-8, bibl. 22, illus.

See *H.A.*, 30: 205.

289. Woodbridge, C. G., and Lasheen, A. M.
The nutrient status of normal and decline Bartlett pear trees in the Yakima Valley in Washington.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 93-9, bibl. 8.

In a 3-year survey of 31 pear orchards a significantly lower level of N was found in the leaves of trees affected with decline than in leaves of healthy trees. It is considered, however, that this may have been a result rather than a cause of decline, being due to a lack of fibrous roots on affected trees. The differences in other elements were less marked. [See also *H.A.*, 29: 3384.]—St. Coll. Wash., Pullman.

290. Lewis, L. N., and Hull, J., Jr.
The effect of gibberellin on the mineral composition of year-old Montmorency cherry trees.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **42**: 784-6, bibl. 7.

Foliar applications of GA at 100, 500 and 1,000 p.p.m. significantly increased the concentration of N and decreased the concentrations of Ca and B in leaves of 1-year-old Montmorency cherry trees. The percentages of P, K, Mg, Mn, Fe and Cu were not altered by GA. [Authors' summary.]

291. Diener, T. O.
Free amino acids and amides in healthy and virus-infected cherry and peach leaves.
Phytopathology, 1960, **50**: 141-5, bibl. 25.

292. Williams, A. H.
The dihydrochalkones of *Malus* species.
Chem. Ind. Lond., 1960, No. 29, pp. 934-5, bibl. 1.

Whereas in most *Malus* spp. the principal phenolic compound in the leaf is phloridzin, in *M. trilobata* an isomer is found. The chemical nature of this isomer is described.

293. Friedrich, H.
Untersuchungen über die phenolischen Inhaltsstoffe von *Pyrus communis* L. 6. Mitteilung: Isolierung und Charakterisierung einer neuen phenolischen Verbindung. **(Phenolic constituents of *Pyrus communis*. 6th Report. Isolation and characterization of a new phenolic compound.)**
Pharmazie, 1960, **15**: 319-22, bibl. 6, illus.

A substance closely related to arbutin was found in young growing organs (cotyledons, hypocotyl and young leaves) of pear. Its properties are discussed. [For part 5, see *H.A.*, 30: 1701.]—Inst. KultPflForsch. Gatersleben, Berlin.

Growth and physiology.

(*See also* 53, 70, 79, 89, 229, 244-248, 251, 263-266, 270, 284, 316, 324, 327, 339, 501, 701.)

294. TAMÁSI, J.
Szőlőben álló vadalanyra (*Malus sylvestris* Mill.) oltott Jonathán almafa gyökérzetének alakulása homoktalajban. (**The root system of a Jonathan apple tree grafted on *Malus sylvestris* rootstock growing in a vineyard on sandy soil.**)
Magyar tud. Akad. Agrártud. Oszt. Közl., 1959, **16**(1): 89-106, from *Hung. agric. Rev.*, 1960, **9**, Abstr. 24.

An examination of a 26-year-old tree of Jonathan on *M. sylvestris* showed that the diameter of the root system was 1·9 times that of the crown. The total length of the roots over 0·3 cm. in diameter was 885 m. The area occupied by the roots was 134 sq.m. and that by the crown spread 44 sq. m.; 69% of the roots were located under the crown spread, the root density beneath the crown being 3·8 times that beyond it. The density of root hairs beneath the crown was 16 times that outside it. When the distribution of the roots in an area of 16 sq. m. surrounding the trunk was studied, most of them were found at a depth of 20 to 60 cm., i.e. at a level the same as, or slightly higher than, the lateral roots of the vines. The tap roots of the vines were found at a depth of 60 to 120 cm., but some of the apple roots penetrated to a depth of 250 cm.

295. SEMIN, M. G.
The winter root growth of apple trees in the Irkutsk region. [Russian.]
Agrobiologija, 1960, No. 2, p. 305.

Four main periods of root growth: April, July, August and November–December.

296. EREMEEV, G. N.
The growth of the absorbing roots of fruit trees in relation to soil conditions. [Russian.]
Doklady Akad. Nauk. S.S.S.R., 1960, **130**: 678-81, bibl. 14.

It was shown for apple trees that 10–11 times fewer absorbing roots were present under conditions of excessive soil moisture (39% dry wt.) than under near optimal conditions (26–28% dry wt.). Dry conditions (12–15% dry wt.) also caused a sharp reduction in the number of absorbing roots. Apple, pear and apricot trees without a crop had 1·5–2 times more absorbing root than trees with fruit. With seedlings of 6 different citrus species, total extension root growth was found to vary greatly in 3 different soils. The proportions of first, second, third or fourth order roots, however, were fairly constant for the species, irrespective of soil differences.

297. REINES, M.
The initiation of cambial activity in black cherry.
Forest Sci., 1959, **5**: 70-3, bibl. 10, illus.

When *Prunus serotina* and pignut hickory (*Carya glabra*) trees were disbudded during dormancy, cambial activity was retarded in the cherry but not in the hickory. Top girdling of the cherry impeded cambial activity only below the girdle. The results suggest that in cherry cambial activity is stimulated by growth substances which originate in active buds, but that in hickory the growth substances involved are independent of the buds.—Univ. Ga, Athens.

298. NESTEROV, JA. S.
The localization of some of the effects of the rest period in apple trees. [Russian.]
Doklady Akad. Nauk, S.S.S.R., 1960, **130**: 925-8, bibl. 11, illus.

Experiments on 3 varieties of apple, in which dormancy was artificially broken in certain regions only, showed that the presence of a dormant length of shoot proximal to an actively growing region reduced leaf size and shoot length. Transpiration of growing shoots which had undergone dormancy was considerably higher than that of shoots which had not been dormant.

299. FEUCHT, W.
Zur Wasserleitfähigkeit von fruchtenden Sprossen beim Apfel. (**The water conductivity of fruiting shoots of apple.**)
ErwObstb., 1960, **2**: 195-7, bibl. 6, illus.

Studies on the varieties Boskoop and Goldparmäne showed that the water conductivity was greater in young vigorous shoots than in older, weaker shoots. The water conductivity of Boskoop was greater than that of Goldparmäne, especially in the long shoots. Shoots damaged by hail had a lower conductivity than healthy shoots.—Inst. Obstb., landw. Hochschule, Stuttgart-Hohenheim.

300. ŠARIPOV, S. K.
Variability in the vegetative buds of pear in relation to their age. [Russian.]
Agrobiologija, 1960, No. 2, pp. 255-8, illus.

In the hot dry Denausk region, Uzbek S.S.R., buds from phasically young hybrid pears made more vigorous growth, which branched more in the first year in the nursery, than buds from phasically old cultivated varieties on the same rootstocks. The variability amongst the buds from one shoot of the hybrids was much greater than amongst the buds from the cultivated varieties.

301. ZELLER, O.
Entwicklungsgeschichte und Morphogenese der Blütenknospen von der Quitte (*Cydonia oblonga* Mill.). (**The development and morphogenesis of quince flower buds.**)
Angew. Bot., 1960, **34**: 110-20, bibl. 9, illus.

The first buds of 3 quince varieties began flower initiation in the autumn, and the initiation and development of primordia continued throughout the winter.—Landw. Hochsch., Stuttgart.

302. Bradley, M. V., and Crane, J. C.
Adverse effect of gibberellin on bud development in some stone-fruit plants.
Calif. Agric., 1960, **14**(10): 12.

In Fay Elberta peach 2 applications of 500 mg. GA per l. had no effect on vegetative or flower buds. With Royal apricot, Jordanola almond and President plum 2 applications of 50 mg. GA per l. inhibited flower bud development, and 250 mg. per l. inhibited vegetative buds. The Bing cherry was intermediate in its response. From a study of sections of buds collected 5 months after treatment it was concluded that the basic effect of GA was an inhibition of cell division with the result that bud scales and leaf and flower primordia failed to form. —Univ. Calif., Davis.

303. Biggs, R. H.
Investigations on growth substances in peach buds.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 341-6, bibl. 19.

Solvent fractionation, column and paper chromatography and the sensitized *Avena* straight-growth bio-assay disclosed 7 growth promoters and 6 growth inhibitors in methanolic extracts of non-dormant peach buds. [From author's summary.] —Fla agric. Exp. Stat., Gainesville.

304. Tuz, A. S.
Flower anomalies in peach and apricot during secondary flowering. [Russian.]
Bot. Žurnal, 1960, **45**: 604-6, bibl. 3, illus.

A description of a type of flower abnormality in each species.

305. Burg, S. P., and Thimann, K. V.
Studies on the ethylene production of apple tissue.
Plant Physiol., 1960, **35**: 24-35, bibl. 41.

Ethylene production by sections of McIntosh apple fruits was decreased, and the respiratory rate increased, in response to wounding. It was also decreased (by more than 50%), without change of respiratory rate, by soaking the tissue in water for 1 hr, but this response was completely prevented by high concentrations of glycerol, hydracrylic amide or potassium chloride, and certain other substances partially inhibited it. The water relations of the fruit tissue were non-typical, in that it lost water and solute when placed in water and gained water when placed in glycerol solutions of high molarity. Both respiration and ethylene production were inhibited by DNP (2,4-dinitrophenol), fluoride, iodoacetamide, arsenite, sodium bisulphite and fluoracetate, the action of the first 2 being partially reversible by ATP or other energy sources. Cyanide, even at high concentrations, did not inhibit ethylene synthesis. There is some indication that the mitochondria are the seat of the process.—Harvard Univ., Cambridge, Mass.

Pruning and training.

(*See also* 200, 216, 231, 266, 270.)

306. Upshall, W. H.
Pruning the tree fruits.
Publ. Ont. Dep. Agric. **392**, revised 1960, pp. 26, illus.

Training and pruning systems described for young and bearing trees.

307. Dahling, R.
Cherry tree training methods.
West. Fruit Gr, 1960, **14**(5): 15-16, illus.

Methods used by various growers to increase tree spread, decrease height and induce early yielding are described and illustrated. The spread of virus-free Bing on mahaleb rootstock, which made very vigorous growth, was increased by thinning to outside branches, and by heading back young wood, when trees started to leaf out. Increased spread and earlier yielding were achieved by tying the branches horizontally for 6 weeks in the spring.

308. Ferdinánd, D.
Metszési időpont hatása az őszibarack vegetációjára és a terméshozamra. (**The effect of the time of pruning on the growth and yield of peaches.**) [English and Russian summaries ½ p. each.]
Kísérl. Közlem., Sect. C, 1959 (issued 1960), **52C**(3): 3-18, bibl. 15.

In a 2-year experiment with young trees of 2 peach varieties the most favourable time for pruning, as measured by the number of buds breaking and shoot growth, was between bud break and the beginning of flowering, preferably nearer to the latter. Yields, however, were reduced by pruning at that time, and were highest following pruning in the autumn before leaf fall.—Agric. Res. Inst. southwest. Trans-Danubia, Keszthely.

Pollination and fruit set.

(*See also* 206, 321, 323, 1180.)

309. Free, J. B.
The pollination of fruit trees.
Bee World, 1960, **41**: 141-51, 169-86, bibl. 6 pp.

A review, dealing with wind and insect pollination, pollen and nectar, bee behaviour and foraging areas, number, strength and distribution of bee colonies needed for pollination, competition between flowers, and aids to, and increased efficiency of, pollination.

310. Griggs, W. H., and Iwakiri, B. T.
Orchard tests of beehive pollen dispensers for cross-pollination of almonds, sweet cherries, and apples.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 114-28, bibl. 11, illus.

Pollen inserts failed to effect either a satisfactory commercial fruit set or an increased fruit set compared with the naturally pollinated controls. Branches protected by bags during the entire flowering period, except for a few minutes when they were hand-pollinated, gave percentages of fruit set several times greater than those exposed while the inserts were operating. Failure of the pollen inserts under orchard conditions was attributed to the fact that the bees failed to carry enough pollen from them to give a satisfactory crop. [From authors' summary and conclusions.]—Univ. Calif., Davis.

311. Maškin, S. I.
Studies on the viability of the pollen and stigmata of flowers developing on detached branches. [Russian.]
Bot. Žurnal, 1960, **45**: 547-51, bibl. 26.

Branches of sour cherry (*Prunus cerasus*), sand cherry (*P. besseyi*), bird cherry (*P. padus*), hazel nut (*Corylus avellana*) and *Acer platanoides* were cut during dormancy, at various times from November to April, and kept with their ends in water at 16–18° C. in the laboratory. Pollen viability, measured by 2 methods, varied from 1·2 to 97·7%, depending on the species and the time of collection. Pollen from cut branches taken in the early spring was equal to, or better than, that collected later from the trees, and was suitable for breeding work. The stigmata on cut branches of these species were also found to mature, and on *Acer platanoides* fruit (samara) set and grew for a month.

312. Rake, B. A.
A note on fruit set and fruit drop in relation to position on the truss in the apple variety Laxton's Superb.
A.R. Long Ashton agric. hort. Res. Stat., 1959, 1960, pp. 57-9, bibl. 2.

Data are given, in relation to position, on order of blossom opening, time of drop of atrophied blossoms, June drop and final set, fruit size and seed number. Size of flower was apparently unrelated to position.

313. E̊saulova, I. N.
The biology of flowering and pollination in pears. [Russian.]
Agrobiologija, 1960, No. 2, pp. 268-70.

In the 4 pear varieties studied, including Beurré d'Amanlis, up to 80–98% of the total number of fruits may be parthenocarpic, the proportion depending on weather conditions at the time of pollination. Even these naturally parthenocarpic varieties gave the greatest yields when cross-pollinated. Conference and Williams' are included in a list of 6 varieties which have good viable pollen able to cross-pollinate most other varieties.

314. Crossa-Raynaud, P.
Nouvelles observations sur l'autocompatibilité chez l'abricotier. (**New observations on the self-fertility of apricots.**)
Ann. Serv. bot. agron. Tunisie, 1957 (issued 1960), **30**: 33-44, bibl. 11.

Of the 8 Tunisian apricot varieties tested, only 2 showed some degree of self-fertility, whereas 10 of the 19 European varieties were completely self-fertile, 2 were self-sterile and the rest were doubtful or partially self-sterile. The comparative rareness of self-fertility in the Tunisian varieties is comparable to that in the apricots of Turkestan, the Crimea and the Irano-Caucasian region.

315. Luckwill, L. C.
The effect of gibberellic acid on fruit set in apples and pears.
A.R. Long Ashton agric. hort. Res. Stat., 1959, 1960, pp. 59-64, bibl. 7, illus.

Observations were made on the results of spraying aqueous solutions of the potassium salt of gibberellic acid (GA) and α-(2-naphthoxy)-propionic acid (2-NOP), both at 50 p.p.m. at petal fall, on dwarf pyramid trees of 6 apple and 2 pear varieties. Results, which are set out in some detail, show that GA can stimulate the early growth of fruit in both apples and pears and is generally more active than 2-NOP at the same concentration. In pears the stimulus from a single application of GA resulted in the production of a full crop of parthenocarpic fruits. In apples sprayed after removal of the styles the stimulus was less strong and in all varieties except Miller's Seedling it was insufficient to hold the fruits on through the June drop. [For an earlier account, see *H.A.*, 30: 1730.]

316. Crane, J. C., Primer, P. E., and Campbell, R. C.
Gibberellin induced parthenocarpy in *Prunus*.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 129-37, bibl. 17, illus.

Aqueous solutions of 50, 250 and 500 p.p.m. of GA were applied as sprays to the almond, apricot, cherry, plum and peach in attempts to promote parthenocarpy. Pollination was prevented either by emasculation or by enclosing the blossoms in muslin bags. The sprays were applied (a) at full bloom only and (b) at full bloom and again 8 days later. None of the treatments was effective in promoting parthenocarpy in the cherry and plum. GA at 500 p.p.m. applied twice brought about parthenocarpic sets of 11·8% in the almond and 15·4% in the apricot. Parthenocarpy in the peach was induced by all concentrations of GA, whether they were applied once or twice. Fruit sets ranging from 63 to 73% were realized as compared with a 42% set of open-pollinated blossoms. Parthenocarpic fruits of all species produced with 500 p.p.m. of GA were not greatly different in size from corresponding open-pollinated control fruits. This suggests that the processes of cell division and enlargement in GA-induced fruits proceeded normally. Maturity of parthenocarpic fruits of all species was up to 10 days earlier than that of open-pollinated fruits. The most pronounced vegetative response of all the species except peach to GA was the formation of long shoots from spurs. Other than an increase in length of internodes, peach shoots appeared normal. Another striking response to GA treatment was inhibition of flower bud differentiation and greatly retarded vegetative bud development in the leaf axils on current-season's growth. The higher GA concentrations in most instances resulted in the complete absence of flower buds on spurs of the almond, apricot, cherry and plum. Buds of the peach, however, appeared unaffected. [From authors' summary.]—Univ. Calif., Davis.

317. BASSO, M.
Contributo allo studio delle cultivar di fico della provincia di Livorno. (**A contribution to the study of fig varieties in the Leghorn province.**) [English and French summaries 8 lines each.]
Riv. Ortoflorofruttic. ital., 1960, **44**: 194-208, bibl. 9, illus.

The ripening of selected figs is advanced by about a month by lightly touching the orifice of the fruit with olive oil, treating not more than 2 fruits per branch. A mixture of olive oil and castor oil effects a slightly more marked advance. Oiling is effective only if carried out when the stigmas are receptive, and appears to induce parthenocarpy. The treated fruits are inferior in quality to those ripened naturally. Descriptions of 11 varieties are given.—Ist. Colt. arbor., Univ. Pisa.

Fruit thinning and development.

(*See also* 265, 357.)

318. ABBOTT, D. L.
Growth substances as fruit-thinning agents for apples: progress report.
A.R. Long Ashton agric. hort. Res. Stat., 1959, 1960, pp. 64-7, bibl. 1.

1-Naphthaleneacetamide was applied at 25 p.p.m. to the same branches of Crawley Beauty in the 3 consecutive years 1957–59. Treatment resulted in fruit thinning each year, but only in 1958 was a significant increase in the number of large fruits (>2½ in.) obtained. [Author's summary.—For earlier work, see *H.A.*, 26: 3363.]

319. ØHLERS, H.
Forsøg med frugtudtynding af aeble ved sprøjtning med plantehormoner. (Kemisk frugtudtynding.) 1955-58. (**Experiments on the fruit thinning of apples by hormone sprays. (Chemical fruit thinning.) 1955-58.**) [English summary 1 p.]
Tidsskr. Planteavl, 1960, **64**: 213-43, illus.

The experiments were carried out in commercial orchards according to standard practice. The application of NAA resulted in 34% fruit thinning and in an average increase in fruit weight of 18%. The results achieved with NA-amide were 16% thinning and a 10% increase in weight. Spraying during the period from petal fall to one week later was shown to be more effective than a later application. Standard strength solutions (15–20 p.p.m. NAA) and concentrations of 33% higher generally proved to be equally effective, but the strength of the solution had to be adapted to the susceptibility of the variety treated. The hormones produced some leaf symptoms, which, however, had no practical significance. With James Grieve the treatment caused a reduction in fruit growth.—Danish Plant Path. Serv.

320. DE LA ROCHA, G.
Informe sobre la aplicación de la hormona "Apponon", en cultivo de manzano. (**Report on the application of the hormone Apponon to apple crops.**)
Inf. mens. La Molina, 1959, **33**(387): 16-17.

Fruit drop in the apple varieties Winter Banana and Pero-Manzano was reduced, ripening advanced and colour improved, by spraying with 0·1% Apponon (a product containing 1% of sodium NAA) at the first signs of drop, i.e. 3–4 weeks before harvesting. Treatment before bud burst in the variety Delicious resulted in more prolific flowering and increased yields.

321. MARSH, H. V., JR., SOUTHWICK, F. W., AND WEEKS, W. D.
The influence of chemical thinners on fruit set and size, seed development, and preharvest drop of apples.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 5-21, bibl. 17.

In experiments with McIntosh and Golden Delicious it was found that sprays of NAA and naphthalene-acetamide (NAD) applied after petal-fall can reduce fruit set without any significant effect on the number of viable or aborted seeds in either the dropping or persisting fruits. The use of NAD as a fruit thinning spray had no significant effect on the pre-harvest drop of McIntosh. There was a slight tendency, however, for chemical thinning to reduce the effectiveness of sprays used for the control of pre-harvest drop on McIntosh. The weight of viable McIntosh and Golden Delicious seeds at maturity was not influenced by effective thinning sprays, neither was seed germination.—Univ. Mass., Amherst.

322. Wiśniewska, J., and Godziejewska, J.
Wpływ chemicznego przerzedzania kwiatów i zawiązków owocowych jabłoni na różnicowanie się pączków kwiatowych. (The influence of the chemical thinning of flowers and of fruit set on flower bud differentiation in apple.) [English and Russian summaries ¾ p. each.]
Prace Inst. Sadown., Skierniewice, 1959, **4**: 130-41, bibl. 21, illus.

Antonovka and Boikenapfel trees were thinned with 0·15% Krezotol (Na-DNOC) and NAA at 40 p.p.m. Flower bud differentiation was delayed for 2 weeks by the NAA treatment in Boikenapfel and a month in Antonovka. The difference in the number of organs in the flower primordia disappeared by the end of September, but the difference in their size persisted until the following April.

323. Batjer, L. P., and Westwood, M. N.
1-Naphthyl N-methylcarbamate, a new chemical for thinning apples.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 1-4, bibl. 1.

Sevin, applied at the rate of 1½ lb. w.p. per 100 gal., was highly effective in reducing the fruit set of Delicious apples when applied 15–19 days after full bloom. The results were very uniform and no overthinning occurred, in contrast to NAA treatment. One spray applied 40 days after full bloom failed to reduce fruit set. The fruits from sprayed trees contained fewer seeds but were significantly larger than those from the control trees. [See also *H.A.*, 30: 248.]—U.S. Dep. Agric., and Wash. St. Univ., Wenatchee.

324. Salah, Y. A.
Effect of gibberellic acid on fruit development of the apple, peach and plum; effect of gibberellic acid on growth and nitrogen status of apple seedlings.
Diss. Abstr., 1960, **20**: 3937-8, being *L.C. Card No. Mic.* 60-1211 of 138 pp.

Gibberellic acid was applied to fruits as a spray, by injection and in lanolin paste. There was no significant effect of either 100 or 200 p.p.m. GA applied as a spray or by stem injection on developing Stayman Winesap apples. Likewise, there was no significant effect of a 200 p.p.m. spray on whole and cut fruits, but a 1% lanolin paste of GA significantly increased the diameter of whole and cut fruits. Repeated applications of GA depressed the growth of peach fruits. Stanley plum fruits were not affected by 100 p.p.m. GA.

One-year-old apple seedlings growing in pots in a glasshouse were subjected to 3 levels of N (nil, medium and high) and 4 levels of GA (0, 150, 300 and 600 p.p.m.), the GA being applied 3 times as a spray at 5-week intervals. GA increased the rate of shoot elongation under all N levels for a few weeks following the first application; however, the greatest increase and most lasting effects were in seedlings growing with no N. Leaves which unfolded during the week following the first application showed a toxic effect, but this effect was less pronounced after the second and third applications. With the medium and high N levels shoot growth after the second and third applications of GA was generally lower than that of seedlings receiving no GA, but final shoot length was not significantly affected. GA significantly increased the shoot diameter and number of lateral shoots where no N was supplied; repeated applications of higher GA concentrations at the medium and high N levels produced smaller shoot diameters and an increased number of lateral shoots. The dry weight of shoots of seedlings grown without N was significantly increased, and that of the root significantly decreased, by GA treatment. Under the medium and high N treatments 3 applications of GA resulted in a marked progressive reduction in the dry weight of roots with increasing GA concentration, and shoot dry weight was also slightly reduced. The total N content of the upper leaves of seedlings grown without N was significantly increased by GA, whereas the total N content of the roots and shoots was significantly decreased. With only one application GA had no apparent effect on the leaf N content of seedlings growing under the medium and high N levels, but after the second and third applications leaf N was less than in seedlings which received no GA.—Ohio St. Univ.

325. Westwood, M. N., and Batjer, L. P.
The use of fruit weight during pit hardening to predict the harvest size of Elberta and J. H. Hale peaches.
Proc. Wash. St. hort. Ass., 1959, pp. 111-13.

A table is given by which the average size of fruits at harvest may be predicted from a knowledge of fruit diameter and of fruit weight at either 14 or 39 days after the beginning of pit hardening. Use of such a table enables the degree of thinning required to be determined. [See also *H.A.*, 29: 2165 and 3310d.]—Wash. St. Univ., Wenatchee.

326. Proebsting, E. L., Jr.
1959 results with 2,4,5-TP on Richards Early Italian prunes.
Proc. Wash. St. hort. Ass., 1959, pp. 56-7, bibl. 2.

Spraying trees with 2,4,5-TP at 20, 25, 30 or 35 p.p.m., 37, 47 or 56 days after full bloom, gave large (33–58%) increases in yields with no decline of fruit size. Addition of Tween-20 at ¾ pt. per 100 gal. to 2,4,5-TP at 3, 4 or 5 p.p.m. gave similar increases in yield. Fruit maturity, as measured by a decrease in the soluble solids content of the fruit, was delayed with increases in yields, but in these trials internal browning was not observed.—Irrig. Exp. Stat., Prosser, Wash.

327. Crane, J. C., and Grossi, N.
Effect of gibberellin on fruit and vegetative growth of the Mission fig.
Proc. 14th annu. Res. Conf. Calif. Fig Inst. 1960, pp. 16-21, bibl. 2, illus.

GA in concentrations of 20, 40 and 80 p.p.m. was applied as an aqueous spray to shoots of the Mission fig at a time when each shoot had produced approx. 6 in. of new growth with 9 leaves and was bearing 5–6 figs, all fruits except the 4 basal ones having been removed. The effect on growth was observed and the following conclusions were reached. As the concentration of GA increased, gains in fruit diameter progressively decreased, with the result that the higher the concentration the smaller the fruit at maturity. Fruit maturity was hastened by 15–25 days, but sugar content tended to decrease with increasing concentration of GA. The reduction in size and sugar content of the fruits was directly associated with the production of vegetative growth, which followed the breaking of the rest of the terminal shoot buds.

Fruit composition and quality.

(*See also* 128, 270, 305, 344, 348, 351, 354, 511.)

328. Baron, C.
Plaisirs des fruits. **(The delights of fruits.)**
Bull. hort. Liège, 1960, **15**: 131-7, 247-52, bibl. 38.

Part I deals with the botanical classification and cytology of fruits grown in Belgium. Part II is mainly concerned with the composition of these and imported tropical and sub-tropical fruits, with special reference to sugars, organic acids, tannins, pigments, essential oils and vitamins, and with the nutritional value of apples and pears.

329. Batt, R. F., and Martin, J. T.
The cuticles of apple fruits.
A.R. Long Ashton agric. hort. Res. Stat., 1959, 1960, pp. 106-11, bibl. 5.

Notes are given on methods of separating surface waxy coverings, of extracting skins with solvents, of determining cutin, of fractionation of waxy substances (1) by acetone precipitation of wax, and (2) by solvent partition, and on phenolic constituents. Comparisons are made of the results obtained with Cox's Orange, Crawley Beauty and Monarch apples. [For earlier work, see *H.A.*, 30: 65 and 1700.]

330. Hilkenbäumer, F., Buchloh, G., and Zachariae, A.
Primäre Amine in Apfelfrüchten und ihr Bedeutung für die Beurteilung physioe logischer Zustandsänderungen im Fruchtparenchym. **(Primary amines in apple fruits and their importance in the estimation of physiological changes in fruit parenchyma.)**
Angew. Bot., 1960, **34**: 104-9, bibl. 11, illus.

The volatile nitrogenous compounds found in healthy, mature fruits of Cox, Ontario and Jonathan were ammonia, iso-amylamine and hexylamine. The same substances were found in fruits which had become brown after frost damage. In fruits with latent or visible low temperature breakdown, ethylamine was also found.—Inst. Obstb., Univ. Bonn.

331. Marek, K., and Simančík, F.
Sledování kyseliny l-askorbové u různých sort skladovaných jablek se zřetelem k jejich hodnocení jako zdroje vitaminu C. **(Studies on the l-ascorbic acid content in different varieties of stored apples in relation to their evaluation as sources of vitamin C.)** [Russian and German summaries ¼ p. each.]
Acta Univ. Agric., Brno, Ser. A, 1959, Special No., pp. 143-52, bibl. 11.

Ascorbic acid determinations were made on a large number of apple varieties stored in a cellar at 10° C. A high ascorbic acid content during the critical spring months was confirmed for Ontario and was also found in Strýmka. Three types of change in the ascorbic acid content were noted during storage.

332. Zalewski, W.
Zawartość komórek kamiennych w miąższu gruszek jako kryterium ich przydatności do produkcji kompotów. **(Stone cells in pears as an index of varietal suitability for canning.)** [English and Russian summaries 1 p. each.]
Prace Inst. Sadown., Skierniewice, 1959, **4**: 376-87, bibl. 2, illus.

Organoleptic tests could be used to distinguish the content of stone-cells in pear varieties but not their distribution, a modified Howard's method being required to determine this. A new method, utilizing Schweitzer's reagent to dissolve the cellulose, is described, and this has given consistent results.

333. Curl, A. L.
Carotenoids of apricots.
Food Res., 1960, **25**: 190-6, bibl. 13, from abstr. in *J. Sci. Food Agric.*, 1960, **11**: ii-75.

β-Carotene amounted to approximately 60% of the total carotenoids; γ-carotene, lycopene and 22 other constituents were present in smaller amounts.

Harvesting, handling and marketing.

(*See also* 518.)

334. Levin, J. H., and others.
Mechanizing the harvest of red tart cherries.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **42**: 656-85, bibl. 1, illus.

A tractor-mounted boom-shaker is described and illustrated. Various types of canvas collecting unit are also discussed. With the boom-shaker a 1½-in. stroke used at 800 cycles per min. proved effective when shaking was continued for 3–5 secs. With careful attachment of the rubber-covered claw and a pressure on the claw of 1,200 p.s.i. serious bark damage was avoided. No root breakage occurred. The fruit collected in this manner was found to be less bruised than fruit picked by hand.

335. Gaston, H. P., Hedden, S. L., and Levin, J. H.
Mechanizing the harvest of plums.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **42**: 779-83, illus.

Mechanical harvesting of Stanley Prune plums, using a tractor-mounted boom-shaker and a portable canvas basin, was quicker and cheaper than hand picking, and fruit quality did not suffer. With Damson plum trees 5% of the fruit came off with the spurs attached and the tests were discontinued.

336. Shipley, R. M., Jr., and Michael, H.
Mechanical harvesting equipment.
Proc. 14th annu. Res. Conf. Calif. Fig Inst., 1960, pp. 24-7, illus.

Brief notes are given on the fig model of the Shipley Harvester, the Goodwin Pick-up, the Goodwin Side Rake and the Goodwin Knife Weeder.

337. Glemmestad, E., and Nordby, A.
Sortering av frukt med maskiner. (**Machines for grading fruit.**)
Frukt og Baer, 1960, **13**: 69-82, illus.

A report on tests with 3 apple and pear graders.

338. Mattus, G. E., Scott, L. E., and Claypool, L. L.
Brown spot bruises of Bartlett pears.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 100-5, bibl. 7, illus.

Pear brown spot is a bruised area in the fruit flesh that is caused by impact bruising of firm fruit. The bruised area is normally not evident externally. Brown spot may occur from impact bruising at any stage in the handling of firm pears. It was found to occur on all lots of pears from all commercial areas examined. In the 1957 season in California by far the greater majority of brown spot bruises resulted from grading, sizing and handling operations of firm fruit at packing houses and/or canneries [see also *H.A.*, 29: 3297]. With other factors constant, the severity of pear brown spot bruising was greater when cold fruit was handled (31° to 41° F.) than when warm fruit was handled (68° F. or higher). [Authors' summary.]—Univ. Calif., Davis.

339. Scott, L. E., Mattus, G. E., and Claypool, L. L.
Observations on the browning reaction in bruised Bartlett pears.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 106-13, bibl. 9, illus.

Brown spot development in Bartlett pears was shown to result from the activity of an oxidase system operative in fruit tissue injured by impact bruising. A browning reaction, simulating browning following bruising, was developed by subjecting slices of pears to water bath temperatures of 60 to 80° C. The relationship between the heat browning reaction and the activity of the oxidase system was demonstrated. Reaction of slices of fruit to the molybdate test for "tannins" was found to be closely related to the susceptibility of the tissue to the browning reactions. Wide variation in the intensity of the browning reaction was found among lots of fruit from different orchards and different areas in California. It is suggested that this variability results from variation in the amount or nature of the substrate for the oxidase, rather than in variation in the activity or amount of the oxidase present. It is further suggested that the molybdate test and the heat browning reaction could be used to determine the susceptibility of pears to brown spot development. [Authors' summary.]—Univ. Calif., Davis.

340. Tomcsányi, P.
Üzemi méretű téli alma szállítási kísérlet. (**Trials on the shipment of winter apples under commercial conditions.**) [Russian and German summaries 2 pp. each.]
Kísérl. Közlem., Sect. C, 1959, **52C**(2): 137-70, bibl. 23, illus.

A statistical examination was made of results obtained in tests with 9 types of container and 15 methods of packing Jonathan apples transported a distance of 1,200 km. Apples packed in plastic-coated pressed paper trays, 2 layers to the container, showed the least bruising and those packed loose in wooden boxes without padding the most bruising.

Storage.

(*See also* 111, 270, 331, 357.)

341. Smock, R. M., and Yatsu, L.
Removal of carbon dioxide from controlled atmosphere storages with water.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 53-60, bibl. 2, illus.

Water scrubbing of gas store atmospheres is cheaper and less noxious than caustic soda scrubbing and the manual operations are faster. It has the disadvantage of adding some oxygen to the storage atmosphere, which makes it essential to have the store completely gas tight. The most efficient system of water aeration involved the use of a packed tower with counter current air flow.—Cornell Univ., Ithaca, N.Y.

342. LEBLOND, C.
L'emploi d'enceintes à parois sélectivement perméables aux gaz pour la conservation industrielle des fruits aux températures moyennes. (**The use of containers with walls selectively permeable to gases for commercial storage of fruit at medium temperatures.**)
C.R. Acad. Agric. Fr., 1960, **46**: 529-35, bibl. 2, illus.

Each container, which holds 6 ordinary fruit boxes, has a base and framework of rigid metal, and top and sides of plastic sheeting 76μ thick. The plastic material is protected by metal bars fixed inside and by grilles outside. In the framework are controllable openings for sampling the internal atmosphere or increasing gaseous diffusion. The containers can be grouped or stacked. Tests on a semi-commercial scale in a cellar at 10–12° C. with Golden Delicious apples and Williams' and Doyenné du Comice pears gave highly satisfactory results, of which details are given for the apples.—Stat. Froid, Bellevue, C.N.R.S.

343. (MCGLASSON, W. B., AND JACOBSEN, J. V.)
Jonathans at Christmas with controlled atmosphere storage.
J. Agric. S. Aust., 1960, **63**: 390-3, illus.

Gas storage was compared with air storage, with and without polythene liners. Jonathans were still in excellent condition after 8 months in gas storage and lasted well for another month out of store. The most suitable atmosphere contained 5% CO_2 and 3% O_2. The incidence of 7 storage disorders with the 3 methods of storage used is tabulated.

344. BLANPIED, G. D., AND DEWEY, D. H.
Quality and condition changes of McIntosh apples stored in controlled atmospheres.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **42**: 771-8, bibl. 3.

McIntosh apples stored in controlled atmospheres of 5% CO_2 and 3% O_2 at 38° F. and in regular cold storage at 33° F. were observed for quality and condition changes during and following storage. Quality differences associated with method of storage were not evident until the fruit had been stored for approximately 100 days. The superiority of the gas-stored apples in respect of flesh firmness, texture, flavour and degree of ripening became more apparent as the storage period lengthened. Loss of quality after removal from storage was similar for apples from both storage conditions at each removal date. Development of senescent core browning, storage scald and mealy breakdown was retarded by gas storage. Puncture tests showed that the skin of gas-stored apples is tougher than that of apples from ordinary cold storage. [From authors' summary.]

345. GUZEWSKA, I., OSTROWSKI, W., AND GDOWSKI, J.
Doświadczenie nad przechowywaniem jabłek i gruszek w chłodni w trzech różnych temperaturach. (**Experiments on the cold storage of apple and pear varieties at three different temperatures.**) [English and Russian summaries 1 p. each.]
Prace Inst. Sadown., Skierniewice, 1959, **4**: 340-64, bibl. 23.

Of the 3 temperatures tested (0° C. throughout, 4° C. throughout, 8° C. at the commencement reduced by 1° C. every fortnight to 0° C.) the first was the most suitable for long storage of most of the 11 apple and all of the 7 pear varieties used. At this temperature weight loss and rotting were least but the incidence of physiological disorders was greatest. Autumn varieties reacted similarly to storage at 4° C. and at 8–0° C., whereas winter varieties kept longer at 8–0° C.

346. MARCELLIN, P.
La conservation des fruits à des températures voisines de la température ordinaire au moyen d'emballages de matière plastique. (**The preservation of fruits at ordinary temperatures in plastic packages.**)
Rev. hort. Paris, 1960, **132**: 2227-33, illus., and *Pomol. franç.*, 1960, **2**(6): 5-13, illus.

Including some data on respiration, gas exchange and fruit quality of apples and pears inside films of different thickness and composition. [See also *H.A.*, 29: 1175y.]

347. OSTROWSKI, W., GUZEWSKA, I., AND GDOWSKI, J.
Wpływ nawożenia mineralnego na wartość przechowalniczą jabłek odmiany Antonówka. (**The effect of mineral fertilization on the storage quality of Antonovka apples.**) [English and Russian summaries, ¾ p. each.]
Prace Inst. Sadown., Skierniewice, 1959, **4**: 365-75, bibl. 7.

The fruit was picked in 1955 from trees planted in 1947 on plots treated with various combinations of N, P and K annually since 1925; one NPK series had been given lime every fourth year. The fruit was stored at 0° C., 4° C., and 8° C. falling to 0° C. The lowest percentage of rotted fruit was found in the samples from the unfertilized plots and the highest in those from the NP plots. Nevertheless the firmest fruit came from the NP plots and the softest from those given NPKCa. Manuring had no effect on physiological disorders.

348. NICOLAISEN-SCUPIN, L.
Acid content of apples during the freezing process. IV. Characterisation of damage caused by cold storage of apples especially under freezing conditions.
Kältetechnik, 1960, **12**: 50-2, from abstr. in *J. Sci. Food Agric.*, 1960, **11**: ii-75.

Acidity increased during refrigeration at —14°[C.], whereas at —5° the increase was less. The increase in acid content did not depend on loss of water from the cell contents. An increase in acidity was only detectable in fruit while it was still frozen; during thawing the acidity fell below that found in fresh fruit. [For earlier work, see *H.A.*, 30: 280.]

349. PRATELLA, G. C.
Avversità delle pomacee conservate. (**Storage diseases and disorders of apples and pears.**)
Inf. fitopat., 1960, **10**: 273-82, illus.

Notes are given on fungus storage diseases [see also *H.A.*, 30: 4966] and non-parasitic disorders of apples and pears, and on damage from storage chemicals, cold and mechanical injury. In each case preventive and/or control measures are suggested.

350. SMOCK, R. M.
Reducing scald.
Amer. Fruit Gr, 1960, **80**(9): 13-14, illus.

Ethoxyquin, which reduces development of apple scald and is being marketed as Stop-Scald, has now received official approval. It is most effective when used as a dip, but fruit in boxes can also be sprayed at the rate of 1 quart per bushel box.—Cornell Univ., Ithaca, N.Y.

351. HARDENBURG, R. E., AND ANDERSON, R. E.
Further evaluation of diphenylamine for the control of apple scald.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 47-52, bibl. 14.

Work on DPA [see *H.A.*, 29: 3301] was continued during the 1958–59 season in 9 storage trials with 5 apple varieties. DPA wraps, dips and a post-harvest spray treatment all controlled scald better than conventional mineral-oil wraps. Apples dipped in DPA and then brushed after drying also developed little scald. The DPA had no marked adverse effect on fruit firmness, decay, breakdown or shrivelling and caused little or no chemical injury on most varieties. [From author's summary.]—U.S. Dep. Agric., Beltsville, Md.

352. ROSS, R. G., AND LOCKHART, C. L.
Influence of orchard fungicides on *Gloeosporium album* rot and storage scab of apples.
Canad. Plant Dis. Survey, 1960, **40**(1): 10-14, bibl. 8.

Excellent control of a storage rot of apples, caused by *Gloeosporium album*, was obtained with an orchard spraying programme of captan in the pre-cover, followed by 3 regular and 2 late cover sprays of captan or a mixture of captan and zineb. Dyrene gave good control without late cover sprays. Some control was obtained when captan or the mercurial fungicides, Phelam [phenyl mercury dimethyl dithiocarbamate] and Phix [phenyl mercury acetate], were used in the pre-cover and followed by 3 regular captan cover sprays. Control of storage scab of apples, caused by *Venturia inaequalis*, was obtained with captan in the pre-cover, followed by 3 regular and 2 late cover sprays of zineb or a mixture of captan and zineb. A regular schedule of dodine [Cyprex] without late cover sprays gave excellent control of storage scab. [Authors' abstract.]—Res. Stat., Kentville, N.S.

353. MOREAU, C., AND MOREAU, M.
Les efflorescences mycéliennes sur fruits. (**Fungal efflorescence on fruit.**) [English, German, Spanish and Russian summaries ¼ p. each.]
Fruit d'Outre Mer, 1960, **15**: 239-41.

A fine bloom on stored apples was shown to be caused by the superficial growth of several fungi, principally *Penicillium expansum* and *Fusarium moniliforme*. To avoid infection the temperature and R.H. of the store should be lowered and the air circulation improved.

354. COUEY, H. M.
Effects of temperature and modified atmosphere on the storage life, ripening behavior, and dessert quality of Eldorado plums.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 207-15, bibl. 6.

A temperature of about 1° C. was required for optimum storage of Eldorado plums during marketing. Fruit held at 3–7° C. softened and coloured during storage and developed an undesirable gelatinous texture. A modified atmosphere, obtained by packing in sealed polythene liners, was a useful supplement to cold storage because it permitted the shipment of fruit in a more mature condition than normal. Plums stored in a modified atmosphere required 10 days to ripen.—Agric. Mktg Serv., Fresno, Calif.

Processing and utilization.

(*See also* 217, 332.)

355. POLLARD, A.
Present trends in apple utilization.
A.R. Long Ashton agric. hort. Res. Stat., 1959, 1960, pp. 139-44, bibl. 12.

Outlets for the lower grades of fruit.

356. KIESER, M. E., POLLARD, A., AND SISSONS, D. J.
The production of opalescent juices from English apples: progress report.
A.R. Long Ashton agric. hort. Res. Stat., 1959, 1960, pp. 145-50, bibl. 9.

Including suitable varieties.

357. WILEY, R. C., AND THOMPSON, A. H.
Influence of variety, storage and maturity on the quality of canned apple slices.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 61-84, bibl. 7.

358. Stoll, K.
Versuche zur Gefrierkonservierung von Zwetschgen, Pflaumen, Reineclauden und Mirabellen. (**Experiments on the deep freezing of damsons, plums, greengages and mirabelles.**)
Schweiz. Z. Obst- u. Weinb., 1960, **69**: 364-8.

Dealing with techniques and varieties.

359. Weckel, K. G., and Lee, H. D.
Composition of cherry seed and cherry seed oil (*Prunus cerasus*).
Food Technol., 1960, **14**: 151-4, bibl. 20, from abstr. in *J. Sci. Food Agric.*, 1960, **11**: ii-75.

The seed contains protein and oil, which have a potential value in animal and human nutrition. The kernel oil is similar to that of sesame.

SMALL FRUITS, VINES AND NUTS.

Strawberries.

(*See also* 89, 112, 151, 274, 373, 493, 530, 1656, 1669.)

360. Il'inskij, A. A.
Raising seedlings and clones of strawberries on different soil types. [Russian.]
Agrobiologija, 1960, No. 2, pp. 243-50, bibl. 6.

Examples are given of the effect on the time of ripening and cropping capacity of strawberry seedlings of 3 different soil types, a sandy soil, a black earth soil and a black earth with compost. The importance of testing new seedlings in different situations is stressed, so that the period required for selection may be shortened.

361. Bell, H. K., Downes, J. D., and Fulton, R. H.
Strawberry variety testing in Michigan, 1957-1959.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **42**: 836-44, bibl. 5.

Of 53 varieties tested Robinson and Premier were the best. Earlidawn was outstanding for yield and earliness but was susceptible to *Verticillium* wilt. The red-core resistant varieties Surecrop and Midway performed fairly well.

362. Kays, W. R.
Strawberry variety performance in Oklahoma.
Bull. Okla St. Univ. Exp. Stat. **B-553**, 1960, pp. 11.

Yields and berry characteristics of tested varieties are listed. Blakemore was the most desirable, since its berries were of excellent quality for the fresh market and for freezing, and the plants were more tolerant of heat and drought.

363. Forest, B.
Un choix de nouvelles variétés. (**A choice of new strawberry varieties.**)
Agriculture, Quebec, 1960, **17**: 8-10, bibl. 1, illus.

Tested at 10 stations, the 4 new varieties averaged higher total yields than the standard Senator Dunlap, and Cavalier, Redcoat and Grenadier also produced a greater early crop. Guardsman was the heaviest and latest cropper, Cavalier the lightest and earliest.—Minist. féd. Agric., Ste-Anne-de-la-Pocatière, P.Q.

364. Statens Forsøgsvirksomhed i Plantekultur.
Sortsforsøg med jordbaer 1957-58. (**Strawberry variety trials, 1957-58.**)
Tidsskr. Planteavl, 1960, **64**: 175-8.

Of the 23 varieties tested at 4 Danish research stations Ydun and Senga Sengana produced the highest average yields, followed by Senga 54 and Senga 59. Quality was also evaluated and other characteristics noted.

365. Heggli, M.
Identifisering og beskrivelse av jordbaersorter. (**Identification and description of strawberry varieties.**)
Frukt og Baer, 1960, **13**: 61-8, bibl. 3, illus.

Vegetative and reproductive characters of 13 varieties.

366. Gertych, Z., and Kostrzewa, Z.
Wartość produkcyjna 17 odmian truskawek w rejonie podgórskim. (**Trial of 17 strawberry varieties in the Carpathian foothills.**) [English and Russian summaries ½ p. each.]
Pieniążek, S. A., Oleksiak, W., and Wojtkiewicz, W.
Wyniki badań z lat 1954-1957 20 odmian truskawek na plantacji porównawczej w Świerklańcu pod Katowicami. (**Results of the 1954-57 trial of 20 strawberry varieties at Swierklanice near Katowice.**) [English and Russian summaries 1 p. each.]
Prace Inst. Sadown., Skierniewice, 1959, **4**: 69-82, bibl. 12, and 83-105, bibl. 22.

Data on yields and quality.

367. Matzner, F.
Über die Variabilität wertbestimmender Inhaltsstoffe in Erdbeeren (*Fragaria grandiflora* Ehrh.) verschiedener Sorten. (**On the variability in nutritional value of different varieties of strawberry.**) [Russian and English summaries about 15 lines each.]
Arch. Gartenb., 1960, **8**: 50-71, bibl. 30.

During the years 1954–1958 a study was made of the composition of many varieties of strawberry.

The average weight of individual fruits was shown to be characteristic of the variety and was also affected by the degree of ripeness. The dry matter content generally increased as the season advanced. The residual dry matter content was affected by varietal differences in the number of seeds. The content of total sugars, as well as of mono- and disaccharides, showed considerable varietal differences. Grosse Fruchtbare had the highest cellulose content of 1·28%, most of the varieties having one of between 0·68 and 0·79%. Differences in the pectin and mineral contents were more pronounced between seasons than between varieties. Significant varietal differences were found in the acid contents and sugar: acid ratios. The vitamin C content was generally higher than the ascorbic acid content, varietal differences being observed. Soltwedel had the highest vitamin C content, with an average of 928·7 mg. per 100 g. of dry matter.—Inst. Acker- u. PflBau, Friedrich-Schiller-Univ., Jena.

368. Knecht, A., and Blommers, J.
Het nieuwe aardbeiras Vola. (**The new strawberry variety Vola.**)
Fruitteelt, 1960, **50**: 953.

A mid-season variety for fresh consumption.

369. Kronenberg, H. G., and Wassenaar, L. M.
Gorella, een nieuw grootvruchtig aardbeiras. (**Gorella, a new large-fruited strawberry variety.**)
Fruitteelt, 1960, **50**: 858-9, illus.

This vigorous, early variety with large well-coloured fruits has been released this year. Its performance in variety trials is reported.

370. Dermer, F.
Erdbeeranerkennung in Deutschland. (**Strawberry certification in Germany.**)
ErwObstb., 1960, **2**: 174-7.

The points which must be noted by an inspector of strawberry plants in Germany are set out in very great detail.

371. Guttridge, C. G.
Further evidence for a growth-promoting and flower-inhibiting hormone in strawberry.
Ann. Bot. Lond., 1959, **23**: 612-21, bibl. 18.

Further experiments with runner plants of the cultivated strawberry joined in pairs as donor-receptor units are reported. Stolon production was promoted in receptor plants in short days by long-day treatment of donor plants. This was a photoperiodic effect induced by low intensity light. As previously, petiole length was again increased and flower induction inhibited by these or similar treatments. An attempt to demonstrate the translocation and activity of a vegetative-growth-inhibiting, flower-promoting hormone gave negative results. It is argued that the photoperiodic control of the growth habit is mediated mainly by a transmissible vegetative-growth-promoting and flower-inhibiting hormone, which is produced in leaves and acts at the growing regions. [Author's abstract.—For earlier work, see *H.A.*, 30: 312.]—Scot. hort. Res. Inst., Mylnefield, Invergowrie.

372. Porlingis, I. C.
Growth and flowering of strawberry plants in relation to endogenous growth substances, applications of gibberellic acid and environmental factors.
Diss. Abstr., 1960, **20**: 4502-3, being *L.C. Card No. Mic.* 60-1947 of 154 pp.

Chromatographic comparisons showed that the main ether-extractable auxin in apices and leaves of Missionary, Sparkle and Catskill strawberries was not IAA, indoleacetonitrile or ethyl indoleacetate. The auxin values obtained for Missionary plants in short or long days were variable and difficult to interpret, but a characteristic negative correlation between auxin content and leaf age was observed. In field-grown Sparkle the auxin content of folded leaves increased from 1 August to 10 October (with decreasing day length), while leaf growth and stolon production were gradually suppressed, and the plants became reproductive and entered dormancy. With Catskill flower initiation and the decrease in vegetative growth in August was not accompanied by any considerable change in auxin content. Chilling of Sparkle plants caused only a slight increase in auxin contents; an increase of auxin in Sparkle was also associated with short-day treatment. [For work on gibberellic acid effects, see *H.A.*, 30: 1816.]—Cornell Univ., Ithaca, N.Y.

373. Smith, C. R.
Effect of autumn applications of potassium gibberellate on fruit production of the strawberry.
Nature, 1960, **187**: 620.

In 1957 single-row replicated plots of Sparkle were treated with 20 and 50 p.p.m. of potassium gibberellate. The next spring the sprayed plots had a heavier, earlier bloom and produced about a 30% larger volume of early fruit. In 1958 another similar experiment was started, using 0, 10, 20, 30, 40, 50 and 100 p.p.m. Some inflorescences were observed later in the autumn on plots sprayed with 40, 50 and 100 p.p.m. and petiole elongation was observed at the 100 p.p.m. level. The 10 and 20 p.p.m. treatments significantly increased, and the 100 p.p.m. treatment significantly reduced, the early yields. As regards total yields there was no significant difference between the unsprayed checks and the 10 p.p.m. treatment, but all the other treatments caused a significant reduction in yield. The application of 3 sprays of 10 p.p.m. in the autumn may enable the grower to command the premium price for early fruit.—Rutgers Univ., New Brunswick, N.J.

374. ROM, R. C., AND DANA, M. N.
Strawberry root growth studies in fine sandy soil.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 367-72, bibl. 8.

See *H.A.*, 29: 2211.

375. BRINGHURST, R. S., VOTH, V., AND VAN HOOK, D.
Relationship of root starch content and chilling history to performance of California strawberries.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 373-81, bibl. 6.

In California winter planting of immature strawberry runners results in lack of vigour and poor performance. Immature plants, however, are often indistinguishable from mature plants by appearance alone. Therefore experiments were conducted to determine whether starch content of the roots might be a useful index of maturity. It was found that starch content in the root cortex of Lassen and Shasta strawberries did follow a pattern associated with maturity and subsequent performance of the plants. Plants dug before 15 November had little or no starch, could not be safely stored, did not survive transplanting well, and if they survived they lacked vigour. Plants harvested between mid November and 1 December had about 50% of the maximum possible starch reserves, and were satisfactory for short-term storage and winter planting but not for long-term storage. Plants harvested after 1 December had starch reserves averaging 75% or more of capacity and were satisfactory for long-term storage as well as for winter planting. The vigour and performance of the plants was directly associated with the amount of chilling they had received; this had an even greater effect on performance than did the level of starch reserves. The vigour response of mature plants to a given period of chilling in storage was similar to that of plants receiving an equal period of chilling in the field before digging [see *H.A.*, 29: 2209].—Univ. Calif., Davis.

376. JEHN, A.
Über die Wirtschaftlichkeit verschiedener Anbausysteme bei Erdbeeren. (**Economic aspects of different methods of growing strawberries.**)
ErwObstb., 1960, **2**: 91-2, 119-23.

In experiments carried out from 1954 to 1958 Macherauch's Früherente and Senga 54 strawberries were used to determine the optimum spacing and the most economic life span of a bed. It was found that a 2-year culture was preferable to a 1- or a 3-year culture, and that with the varieties tested a spacing of 10 cm. within the row gave the highest yields [see also *H.A.*, 29: 1231j]. More vigorous varieties would, of course, require a wider spacing.—LandwKammer. Rheinland, Bonn.

377. THORSRUD, J.
Dyrkingsforsøk med jordbaer. III. Sammenlikning av ulike jordarbeidingsmåter. IV. Virkningen av ulik planteavstand. (**Cultural trials with strawberries. III. A comparison of different soil cultivation methods. IV. The effects of different spacings.**)
Frukt og Baer, 1960, **13**: 13-17, bibl. 1.

III. Rotary cultivation up to 3 times per year had no significant effect on yield, quality or size of Abundance fruits in comparison with no cultivation (except hoeing when necessary). Strawing improved fruit quality in the first year, and reduced grey mould in both years. IV. Yields from Abundance D 52 in the first year increased as plant spacing decreased from 60 cm. to 20 cm. in both the spaced-row and matted-row systems. In the second year the same trends were observed with the spaced-row system, but the highest yields from the matted rows were obtained from a spacing of 40 cm. apart in the row. It is suggested that spacing in spaced rows could be closer than that normally accepted, but with matted rows spacing could be increased from the usual 33 cm. to 45 cm. [For parts I and II, see *H.A.*, 28: 2258.] —Stat. Forsøksgard, Kise.

378. THOMPSON, B. D.
Response of strawberries to mulching with plastic.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 179-85, bibl. 13.

An opaque plastic mulch suppressed weeds, conserved soil moisture, increased soil temperatures in cool weather and reduced them in warm weather and increased yields. With the advent of hot weather, however, plants grown with plastic mulch tended to decline more rapidly than non-mulched plants. Weekly applications of captan, combined with plastic mulch, appeared to act synergistically as measured by increased yields.—Fla agric. Exp. Stat., Gainesville.

379. LJONES, B.
Gjødslingsforsøk med jordbaer. (**Manurial trials with strawberries.**)
Frukt og Baer, 1960, **13**: 42-51, bibl. 9.

No general trend in strawberry response to N fertilizers was apparent, nor did superphosphate applications affect fruiting. Yields were not improved by the use of potassium sulphate, and in some cases yields were reduced, fruit number being affected rather than fruit size. These and other studies have shown that there is no value in K application when the soil content is above 8–10 mg. per 100 g. Dolomite had little effect on yields, but in two trials farmyard manure did significantly increase yields.—Agric. Coll. Norway, Vollebekk.

380. Smith, C. R., and Childers, N. F.
Controlled phosphorus, potassium and magnesium studies with strawberry.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 360-6, bibl. 8.

A greenhouse study in 1955 involved the effects of 2 levels of P (1·9 and 9·3 p.p.m.), 3 levels of K (39, 117, 195 p.p.m.) and 2 levels of Mg (12 and 24 p.p.m.) in the nutrient solution on growth and chemical composition of Sparkle strawberry plants. In 1956 a similar study was conducted using a wider range of 4 levels of K (20, 98, 176 and 254 p.p.m.) and 3 levels of Mg (6, 18 and 30 p.p.m.). No foliar symptoms of nutrient deficiencies were detected in either study. A foliage level of 0·22% P was associated with generally restricted growth. K levels of about 1% in the foliage were associated with some restriction in growth but less than that observed at the low P level. Mg at 6 p.p.m. in the nutrient solution significantly reduced the foliar Mg but did not reduce growth At the relatively high level of 30 p.p.m., however, some reduction in the weight of various plant parts was found. [From authors' summary and conclusions.] —Rutgers St. Univ., New Brunswick, N.J.

381. Fateeva, O. F.
The effectiveness of the region of application of organo-mineral fertilizers to strawberries. [Russian.]
Sadovodstvo, 1960, No. 5, pp. 25-6.

Fertilizers were applied in 3 different ways to irrigated strawberries planted in double rows: (1) 40 tons of FYM per ha. broadcast and ploughed in + 4 top dressings with NPK fertilizer; (2) 2 tons of FYM or compost in the planting rows + 200 kg. per ha. superphosphate + 4 top dressings with NPK fertilizer; and (3) as in 2 with the addition of a pre-planting root dip in azoto- and phosphorobacterins. Yields over 2 seasons were greatest with treatment 2.

382. Proebsting, E. L., and others.
Fertilizer trials with Shasta and Lassen strawberry varieties in three producing areas.
Calif. Agric., 1960, **14**(10): 6-7.

These trials indicate that neither the blade nor the petiole can be considered the better tissue for analysis to show nutrient effects. Compared with deciduous trees it is more difficult to sample strawberries accurately with respect to age, and a higher sampling error probably results.—Univ. Calif., Davis.

383. Peabody, D. V., Jr., Crandall, P. C., and Roché, B.
Weed control in strawberries for western Washington.
Ext. Misc. Publ. Wash. St. Univ. **11**, revised 1960, 1 folded sheet.

Simazine for early and late application, sesone for routine treatment.

384. National Weed Committee, Eastern Section.
[Weed control in] fruits.
Res. Rep. east. Sect. nat. Weed Cttee Canada, 1959, pp. 83-9.

Five reports are summarized. *Strawberries:* In established crops promising results were shown by amiben at 6 lb./acre, neburon at 2–4 lb./acre, 2,4-DES at 4 lb./acre, trietazine at 2 lb./acre, dinoseb (granular) at 4 lb./acre and CDAA at 5 lb./acre. *Upland cranberries:* July treatments were unsatisfactory, but Urab (liquid) in fuel oil applied at the end of September gave good weed control with little crop injury. *Blueberries:* When applied in May or July promising weed control was shown by amitrol 21% at 1–3 gal./acre.—From *Weed Abstr.*, **9**. No. 958.

385. Hamm, R.
Die Verwendung von Folienhauben zur Verfrühung der Erdbeerernte. (**The use of plastic cloches to obtain an earlier strawberry crop.**)
Die Wirtschaftlichkeit der Folienhauben-Verwendung zur Verfrühung der Erdbeerernte. (**The profitability of plastic cloches for obtaining an earlier strawberry crop.**)
Rhein. Mschr. Obstb., 1960, **48**: 90-2 and 123, from abstrs in *Beerenobstschrift.*, 1960, No. 19, p. 4 and p. 5.

Under plastic cloches the strawberry crop was a fortnight earlier than in the absence of protection, but fruit quality and fruit size were inferior. The advance of cropping, however, proved profitable in spite of these drawbacks.

386. Schuricht, R.
Untersuchungen über den Einfluss von Fruchtgrösse und Ertrag auf die Leistung beim Pflücken von Erdbeeren. (**Studies on the effect of strawberry fruit size and yield on picking rate.**)
Arch. Gartenb., 1960, **8**: 105-8, bibl. 4.

Picking rate was found to be proportional to a linear function of the fruit size added to a logarithmic function of the yield per unit length of row. This relationship is expressed mathematically by an equation.—Inst. Gartenb., Dresden-Pillnitz.

387. Morrison, W. W.
Preparing strawberries for market.
Fmrs' Bull. U.S. Dep. Agric. **1560**, revised 1959, pp. 18, illus.

Harvesting, grading, packing, inspection and transport.

388. Austin, M. E., Shutak, V. G., and Christopher, E. P.
Color changes in harvested strawberry fruits.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 382-6, bibl. 5.

It was found that harvested strawberry fruits will develop full colour at a high temperature (75 and 85° F.) in complete darkness. When berries which were greenish white up to 10% pink were placed at a temperature of 85° F. full colour development resulted in 48 hours. About 90% of full colour developed at 65° F. after 96 hours. At 55° F. good colour development did not occur. A low light intensity, 25 f.c., slightly increased speed and degree of coloration at a high temperature. Light had very little effect at 55° F. Soluble solids content of berries ripened in the dark compared favourably with that of field-ripened fruits. [Authors' summary and conclusions.]—R.I. agric. Exp. Stat., Kingston.

389. Thompson, B. D.
Post-harvest treatments of strawberries and radishes with cobalt-60 irradiation.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 114-23, bibl. 8, illus.

Irradiation with gamma rays from Co^{60} was compared with dips of sodium dehydroacetate for the control of strawberry fruit rots. A dosage of 258,000 r resulted in good decay control under satisfactory storage conditions. Dipping the strawberries into an 0·8% solution of DHA-S also gave good control [see also *H.A.*, 29: 264], and neither treatment affected the pH, titratable acidity, soluble solids or flavour of the fruits. Irradiating radishes with 17,200 r or more, or dipping them into 50 to 100 p.p.m. oxytetracycline, effectively controlled black spotting and sprouting during storage at 70° F., though neither treatment is yet recommended.—Fla agric. Exp. Stat., Gainesville.

390. Landfald, R.
Lagring og transport av baer. (**Storage and transport of berries.**)
Frukt og Baer, 1960, **13**: 5-12, bibl. 9, illus.

The author discusses problems and possibilities in the storage and transport of berries, with reference to published work. At Vollebekk it has been shown that storage of strawberries and raspberries in 20% CO_2 will give comparable results (i.e. doubling the storage life) to cooling from 17° to 5° C. In another Norwegian experiment the keeping quality of strawberries in cold storage was increased by 20% by packing the fruit in plastic.

391. Gdowski, J., Guzewska, I., and Ostrowski, W.
Kolejowy transport truskawek z zastosowaniem lodu naturalnego i suchego. (**Rail shipment of strawberries using ice and dry ice.**) [English and Russian summaries 1 p. each.]
Prace Inst. Sadown., Skierniewice, 1959, **4**: 318-39, bibl. 13.

Uninsulated and insulated rail vans, ice and dry ice as cooling agents, and 3- and 5-day transit periods were compared, using a bad shipping variety Sharpless and a good variety Mme Moutot. Temperature proved the most important factor; this was kept low more effectively in the insulated vans and by the use of dry ice. As the vans were not air tight, the desired concentration of CO_2 therein could not be attained with the dry ice. Length of transit period was also important, the percentage of unsound fruit being much greater on the 5-day journey. [For similar work on cherries, see *H.A.*, 29: 2181.]

392. Dennis, C. C.
Strawberry purchases—purchase trends and characteristics of purchasers.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **42**: 859-70, bibl. 1.

Data obtained from a consumer panel are analysed to show the influence of time of year, family income, family size, housewife employment and age of housewife on the purchase of fresh and frozen strawberries in Michigan. Interesting points are that (1) if family size is increased from 2 to 4, fresh strawberry consumption increases only from 8 to 8½ lb. per family, (2) working housewives buy more strawberries, and (3) after the age of 55 strawberry consumption decreases rapidly.

Other small fruits.

(*See also* 63, 88, 146, 165, 274, 384, 390, 1656.)

393. Sági, F., and others.
Adatok *Fragaria-*, *Grossularia-*, *Ribes-* és *Rubus*-fajok és fajták azonosításához, valamint kemotaxonómiájához. (**A contribution to the identification and chemotaxonomy of *Fragaria, Grossularia, Ribes* and *Rubus* species and varieties.**) [Russian and German summaries ½ p. each.]
Kísérl. Közlem., Sect. C, 1959 (issued 1960), **52C**(3): 19-28, bibl. 19.

The organic acids, sugars and pigments of these small fruits were analysed by paper chromatography [see also *H.A.*, 29: 1183]. The results showed that the various species could be identified by this means but not the varieties. Thus the relationship between the 2 descendants of *Ribes petraeum*, varieties Vierlander and Caucasian, appeared debatable on these grounds, whereas varieties of *Ribes vulgare*, *R. nigrum* and *Rubus idaeus* appeared to have a common origin. In the genus *Ribes*, *R. fasciculatum* was aberrant in that it contained a carotenoid in place of the normal anthocyanin pigment. The least homogeneous genus was *Rubus*.—Res. Inst. Pl. Breed., Feitöd.

394. ANON.

Une plante très utile, l'*Actinidia chinensis*, à la fois ornementale et à fruits comestibles. **(*Actinidia chinensis*, a very useful plant, being ornamental and having edible fruits.)**

Courr. hort., 1960, **22**: 267-70, illus.

The features of the Chinese gooseberry, *Actinidia chinensis* (*sinensis*), are compared with those of *A. arguta*, *A. kolomikta* and *A. polygama*. Instructions are given on soil, planting, manuring, mulching, propagation and pruning.

395. SHARPE, R. H., AND DARROW, G. M.

Breeding blueberries for the Florida climate.

Proc. Fla St. hort. Soc., 1959, 1960, **72**: 308-11, bibl. 3.

Progress in developing varieties with low winter-chilling requirements. [See also *H.A.*, 29: 2186y.]

396. CRANG, A., AND LEACH, M.

The preserving qualities of some varieties of highbush blueberries.

A.R. Long Ashton agric. hort. Res. Stat., 1959, 1960, pp. 151-4, bibl. 5.

Experiments made with a number of highbush blueberries under trial by the N.A.A.S. at Sugar Hill, Bere Regis, showed the varieties Burlington, Concord and Pemberton to be the most satisfactory as regards their preserving qualities.

397. WOODRUFF, R. E., DEWEY, D. H., AND SELL, H. M.

Chemical changes of Jersey and Rubel blueberry fruit associated with ripening and deterioration.

Proc. Amer. Soc. hort. Sci., 1960, **75**: 387-401, bibl. 24.

The following chemical changes were recorded during ripening of blueberry fruits sampled at intervals from the time of development of red colour in the skin for a period of 20 days: The sugar content increased for 9 days and then remained constant. The titratable acid content decreased continually as ripening progressed. The intensity of pigmentation increased for the first 6 days following red colouration and then did not change. Soluble pectin content decreased continually and was associated with increased pectin methylesterase activity. Other organic constituents, namely starch, acid hydrolyzable polysaccharides, ether soluble material, lignin and cellulose, did not change markedly. There was a positive linear relationship between the sugar-acid ratios of the fruit on a fresh and dry weight basis and fruit ripening. The shelf-life of fruit samples containing berries of various degrees of ripeness was highly correlated with the sugar-acid ratios of the fruit at harvest. As the sugar-acid ratios increased, fruit deterioration during holding at 40° and 75° F. became more severe. [See also *H.A.*, 30: 3434.]—Mich. St. Univ., East Lansing.

398. ANON.

Bessen aan hagen? **(Currants as hedges?)**

Fruitteelt, 1960, **50**: 1087.

Two seasons' yields are tabulated for 4 red currant varieties grown in 2 forms of hedge system.—Proeft. Numansdorp.

399. BOULD, C.

Manurial experiments with fruit. III. Progress report on NPK experiments with black currants at Efford and Luddington N.A.A.S. Experimental Horticulture Stations.

A.R. Long Ashton agric. hort. Res. Stat., 1959, 1960, pp. 84-92, bibl. 5.

The negative or even deleterious effect of the application of more than 3 cwt. acre of N fertilizer and its connection with water and soil acidification are discussed. P fertilizers varied in effect, this being nil at Luddington but appreciable at Efford. At Luddington also K fertilizers had no effect, and the same happened at Efford but in the first year of the trial only. The trials are being continued and the effects of irrigation on growth, yield and leaf-nutrient status will be investigated.

400. LJONES, B., AND EDLAND, T.

Nitratinnhaldet i jorda under ulike jordkulturmåtar i frukt- og baerdyrkinga. **(The nitrate content of soil under different soil management methods for top and small fruits.)**

Frukt og Baer, 1960, **13**: 24-30, bibl. 3.

Soil nitrate contents (determined by the brucin method) ranging from 0·8 to 48·3 mg. per 100 g. air-dried soil were found during the summer in the root zones of black currant bushes, variety Bang Up. In the leaves of these bushes the nitrate content varied from 2·16% to 3·4% of the dry weights. In a comparison of 2 soil management systems for currants, the average nitrate content during the summer in clean cultivated soil was 9·8 mg., while in soil cultivated once followed by a weed cover crop, nitrate contents averaged 3·7 mg. Two years after a grass sod below apple trees had been ploughed in, the soil nitrate content was higher than that of soil clean-cultivated for several years. Soil mulched round the trees with fresh grass contained an average of 34·6 mg. nitrate during summer sampling, this being the highest content recorded in a comparison of 5 methods of soil management. Analyses of soils under different plant species showed that white clover sod had a higher nitrate content than meadow fescue or ryegrass sods.—Agric. Coll. Norway, Vollebekk.

401. MULDER, A.

Bestrijding van haagwinde in bessen. **(The control of bindweed in currants.)**

Fruitteelt, 1960, **50**: 1057.

Bindweed (*Convolvulus sepium*) in currants was successfully controlled by sprays of either MCPA (1 kg. active ingredient per ha.) or MCPB (2·5 or

5·1 of a 40% material per ha.).—R.T.C. voor PlZiekt., Wageningen.

402. HOBBIS, E. W., AND CATLOW, E.
The performance of a clonal loganberry at Long Ashton: I. Training methods and cropping.
A. R. Long Ashton agric. hort. Res. Stat., 1959, 1960, pp. 78-83, bibl. 5, illus.

The sub-clone LY.59 [see *H.A.*, 29: 174].

403. HASKELL, G.
Biometrical characters and selection in cultivated raspberry. [Dutch summary 9 lines.]
Euphytica, 1960, **9**: 17-34, bibl. 17, illus.

Vegetative flowering and fruiting characters were analysed, and fruit qualities, including size, shape and texture, were assessed. Although heterosis may influence size, large fruited inbreds are obtainable. The conical shape may be associated with favourable fruit qualities, but there is no correlation between fruit size or shape and ease of picking. Backcrossing to a quality flavoured clone increased the frequency of good flavoured seedlings, but segregation occurred in sibs, selfs and backcrosses. Of 36 seedlings selected on biometric assessment out of 841 and tested for 2 years 21 had higher yields and 9 had lower yields than the controls.—Scot. hort. Res. Inst., Dundee.

404. GERTYCH, Z., OLEKSIAK, W., AND KOSTRZEWA, Z.
Wartość produkcyjna 10 odmian malin w pierwszych latach owocowania plantacji w rejonie podgórskim. **(Trial of 10 raspberry varieties in the Carpathian foothills.)** [English and Russian summaries ½ p. each.]
PIENIĄŻEK, S. A., OLEKSIAK, W., AND WOJTKIEWICZ, W.
Wartość produkcyjna i skład chemiczny owoców 10 odmian malin w Świerklańcu pod Katowicami. **(Trial of 10 raspberry varieties at Swierklanice near Katowice.)** [English and Russian summaries ¾ p. each.]
Prace Inst. Sadown., Skierniewice, 1959, **4**: 41-52, bibl. 5, and 53-68, bibl. 17.

Data on yields, quality and disease resistance.

405. OLEKSIAK, W., AND OTHERS.
Uszkodzenia mrozowe odmian malin w zimie 1955-1956 r. **(Frost damage to raspberry varieties in the 1955-1956 winter.)** [English and Russian summaries ¾ p. each.]
Prace Inst. Sadown., Skierniewice, 1959, **4**: 207-14, bibl. 2.

Similar injury ratings to those obtained at another place in Poland [see *H.A.*, 29: 2264].

406. BENNETT, E., AND WEEKS, W. D.
Hemicelluloses and winter hardiness in raspberry canes.
J. agric. Food Chem., 1960, **8**: 321-2, bibl. 9.

No relationship between hardiness and hemicellulose composition was found. Xylose was present in the greatest amounts.—Mass. agric. Exp. Stat., Amherst.

407. RAJAPPAN, P. V., AND BOYNTON, D.
Responses of black and red raspberry root systems to different oxygen and carbon dioxide pressures at two temperatures.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 402-6, bibl. 5, illus.

In greenhouse experiments raspberry plants were grown in a rooting medium aerated with various gas mixtures ranging from 21% O_2: 79% N (air) to 0% O_2 : 100% N, and also in a mixture containing 10% O_2 : 10% CO_2 : 80% N. The treatments were given at 2 temperature levels, 55–60° F. and 65–70° F. New root development was progressively reduced as the oxygen concentration was decreased. The gas mixture containing 10% CO_2 and 10% O_2 virtually prevented new root development. The ability of the buds on the stems to develop into shoots was directly associated with root growth, and no shoot development occurred on plants whose roots were in an atmosphere of pure N or in one containing 10% CO_2 and 10% O_2. Greater root growth and shoot development occurred at the lower temperature level. The production of suckers from the larger roots was greatest in the low oxygen treatments (5% O_2 for black raspberries and 5 or 10% O_2 for red raspberries). It is suggested the reduced bud growth and increased sucker development associated with the low oxygen levels may be the result of decreases in the production of growth-promoting and growth-inhibiting substances, respectively.—Cornell Univ., Ithaca, N.Y.

408. ZATYKÓ, J.
A *Rubus mohácsyanus* Porp. szedermálna fajhibrid vegetatív szaporítása gyökereztetéssel. **(The vegetative propagation by layering of the blackberry-raspberry interspecific hybrid *Rubus mohacsyanus* Porp.)** [English and Russian summaries ½ p. each.]
Kísérl. Közlem., Sect. C, 1959 (issued 1960), **52C**(3): 29-32, bibl. 3, illus.

The vegetative propagation of this shy-rooting hybrid was achieved by cutting back vigorously growing shoots, anchoring their tips and covering them with a layer of soil 2–3 cm. deep. Around the bases of the emerging shoots the soil was mounded up to induce etiolation, which was followed in the autumn and early spring by rapid rooting.—Res. Inst. Pl. Breed., Fertőd.

Vines—general.

(*See also* 172.)

409. Vega, J., and Alcalde, A. J.
Panorama vitícola en las provincias de Santiago del Estero y Córdoba. (**Survey of viticulture in the provinces of Santiago del Estero and Cordoba.**)
Idia, 1960, No. 146, pp. 1-10, bibl. 2, illus.

The subjects discussed are: areas under vines; climatic conditions; varieties, including table and wine varieties recommended for extended planting; cultural practices, including supports and training methods (illustrated), spacing, cultivation and pruning; and diseases.

410. Blanchet, B., and others.
Équilibre économique en matière de viticulture. Rapports nationaux. (**The economic balance in viticulture. National reports.**)
Bull. Off. int. Vin, 1960, **33**(354): 47-65, (355): 44-59.

Economic crises, their causes and prevention; reports from France, Algeria, Hungary, Luxembourg, Morocco, Switzerland and Tunisia.

411. Xandri Tagüeña, J. M.
Estudio del equilibrio económico en materia de viticultura. (**A study of the economic balance with regard to viticulture.**)
Bol. Inst. nac. Invest. agron. Madrid, 1960, **20**: 113-40.

Spanish problems of reducing production costs and increasing the demand for wine and grapes are discussed.

412. Gutiérrez, C. S., and Formento, J.
Costo de producción del vino comun de traslado en Mendoza, año 1957. (**The cost of production of ordinary draught wine in Mendoza in 1957.**)
Bol. téc. Fac. Cien. agrar. Univ. nac. Cuyo **19**, 1959, pp. 32.

The last 8 pages deal with costs of producing the grapes.

413. Eidg. Kommission zur Ermittlung der Produktionskosten der Trauben und des Weines.
Die Neuanlagekosten im schweizerischen Weinbau. (**The cost of establishing new vineyards in Switzerland.**)
Schweiz. Z. Obst- u. Weinb., 1960, **69**: 345-51, 371-4, and *Landw. Jb. Schweiz*, 1960, **9**: 285-300 [in German and French].

414. Durquéty, M.
Le vignoble et la viticulture pyrénéens. (**Vineyards and viticulture in the Pyrenees.**)
Progr. agric. vitic., 1960, **153**: 263-73, 295-302, 318-30, 352-9; **154**: 18-28, 50-61, 87-91, bibl. 47, illus.

An historical review.

Vines—breeding and varieties.

(*See also* 202.)

415. Olmo, H. P.
Plant breeding program aided by radiation treatment.
Calif. Agric., 1960, **14**(7): 4.

Progress is reported on a project to obtain a new Perlette vine variety with a loose cluster. The method involves treating excised dormant buds with X-rays of about 2500r. These are then grafted onto older stocks for quick fruiting and evaluation. —Univ. Calif., Davis.

416. Geisler, G.
Untersuchungen zur Frühdiagnose von Leistungseigenschaften in der Edelreis- und Unterlagenzüchtung bei Reben. (**Studies on the early evaluation of the performance of newly bred vine varieties and rootstocks.**)
Vitis, 1960, **2**: 117-33, bibl. 5, illus.

With the aid of statistical methods it was found that the morphological characters of one-year-old vine seedling rootstocks can give a good indication of their later performance if evaluated after the first pruning. In the case of newly bred varieties, one-year-old seedlings were also shown to lend themselves to pre-selection after the first pruning, a particularly close correlation existing, for instance, between leaf serration and yields.—Bundesforsch-Anst. Rebenzücht., Geilweilerhof.

417. Čizmazija, J.
Raising seedlings of grape vines in pots without bottoms. [Russian.]
Agrobiologija, 1960, No. 2., pp. 300-1, illus.

Seedlings planted in inverted bottomless clay pots developed more quickly than in normal pots, so that the process of selection was speeded up.

418. Inglez de Sousa, J. S.
Mutações somáticas na videira Niagara. (**Somatic mutations of the Niagara vine.**) [English summary ½ p.]
Bragantia, 1959, **18**: 387-415, bibl. 35, illus.

Descriptions are given of 7 varieties derived by somatic mutation from Niagara, a *Vitis labrusca* × *V. vinifera* cross. One of these, Niagara Rosada, occupies 60% of the area under vines in São Paulo State.

419. Fahmy, I.
22 varieties of muscadines compared for use in State.
Miss. Fm Res., 1960, **23**(5): 8.

Data on fruit size and composition.

Vines—propagation and rootstocks.

(*See also* 432, 553.)

420. Dolgova, A. E.
The causes of low germination of grape seeds. [Russian.]
Agrobiologija, 1960, No. 2, pp. 302-3.

The embryos of some early ripening varieties fail to develop properly owing to an early hardening of the pericarp, which restricts their supply of nutrients.

421. Barrett, H. C.
Black polyethylene plastic film. Effect on the rooting and vegetative growth of grape hardwood cuttings.
Amer. Nurserym., 1960, **112**(1): 128-9.

Hardwood cuttings of Seyve-Villard 12-375 were planted in early May with or without a black plastic mulch. There were no significant differences in rooting percentages, but there was almost a 75% ncrease in the weight of the rooted plants under the mulch.—Univ. Ill., Urbana.

422. Mazanašvili, G. K.
Establishing the resistance to chlorosis of vine rootstock varieties. [Russian.]
Vinodelie i Vinogradarstvo, 1960, **20**(3): 43-4.

The performance of 4 vine varieties on 5 different rootstocks was tested in Georgia. The greatest resistance to chlorosis and the highest yields were shown by Berlandieri × Riparia 420A, followed in both respects by Berlandieri × Riparia 5BB and Chasselas × Berlandieri 41B.

423. Novopavlovskaja, N. V.
Ascorbic acid in self-rooted and grafted vines. [Russian.]
Bjull. nauč.-tehn. Inf. centr. genet. Lab. Mičurina, 1957, No. 3, pp. 15-19, from *Ref. Ž.* (*Biol.*), 1958, No. 23, Abstr. 104,812

During the whole growing period the ascorbic acid content in all organs, including fruit, was higher in grafted vines than in those grown on their own roots.

424. Hegedus, Á.
A szőlő vízforgalmára vonatkozó vizsgálatok. (**Studies on water relations in vines.**) [Russian and French summaries ¾ p. each.]
Kísérl. Közlem., Sect. C, 1959, **52C**(2): 3-27, bibl. 64.

Observations over 6 years on the flow and concentration of sap in scions, rootstocks and grafted vines indicated that the main controlling factors were the variety, soil temperature and soil moisture. In grafted vines the sap started to rise when the soil temperature at a depth of 20 cm. rose above 8° C., but vines grown on their own roots in sandy soil required a higher temperature. More experimental work is needed to ascertain whether differences in water relations affect compatibility between stock and scion.

Vines—climate and air pollution.

(*See also* 432.)

425. Tuzson, I.
Az időjárási tényezők befolyása a borok extrakttartalmára. (**The influence of climatic factors on the total solids content of wines.**) [French and Russian summaries 1 p. each.]
Kísérl. Közlem., Sect. C, 1959 (issued 1960), **52C**(3): 93-117, bibl. 14.

In a 7-year study a high correlation was found between the total solids content of wines and the modified precipitation sum, calculated as the mean temperature plus total precipitation over the 5-month period May to September. A lesser correlation was found between the total solids content and the modified precipitation sum during July to September.—Inst. vitic. Res., Budapest.

426. Nigond, J.
Le retard au débourrement de la vigne par un traitement à l'acide α-naphthalène acétique et la lutte contre les gélees. (**Delaying bud break in vines by the use of α-naphthalene acetic acid and the control of frost.**)
C. R. Acad. Agric. Fr., 1960, **46**: 452-7.

Tests in the years 1955–1957 on Aramon grape vines at the École Nationale d'Agriculture de Montpellier have shown the efficacy of spraying the vines early in January, in the third week in February or even in the second week in March with NAA at 0·75–1·00% concentration for retarding bud break by 16–27 days and so obviating late frost damage. Spraying in the previous autumn had little or no effect. The applications would appear to have had no other significant effect on the growth or health of the plants. The method is considered to be very promising, but exact schedules of dates, concentrations, etc., need to be worked out for different vines and different conditions.

427. Ferro, O.
Stima di danni da emanazioni gassose tossiche. (**Estimation of damage caused by toxic factory gases.**)
Agric. Venezie, 1960, **14**: 364-83, bibl. 10, illus.

The considerable losses sustained each year by vine growers and others in the neighbourhood of factories of various kinds are noted. They are due to fluorine emanations. Such emanations can be rendered more or less harmless by appropriate treatment.

Vines—growth, reproduction and physiology.

(*See also* 294, 424, 449, 454, 496.)

428. Enin, T. K., and Lesnaja, G. M.
A morphological-anatomical study of fasciated shoots of grape vines. [Russian.]
Vinodelie i Vinogradarstvo, 1960, **20**(4): 31-4, bibl. 5, illus.

Fasciated shoots, which arise as a result of the simultaneous development of 2 or 3 growing points in one bud, are described and illustrated with photomicrographs. These abnormal shoots arise spontaneously like mutations, and occur in conditions of abundant nutrition or following treatment with certain growth substances.

429. LITVINOV, P. I.
The use of labelled atoms in the study of the intensity of root regeneration in vines and the determination of the relationship between individual roots and branches. [Russian.]
Vinodelie i Vinogradarstvo, 1960, **20**(5): 37-40.

Roots of irrigated and non-irrigated vines were pruned along one side 65 cm. from the centre of the bushes, and on 23 June granulated superphosphate labelled with P^{32} was placed in bands 35 cm. deep 15 or 30 cm. away from the cut roots. Movement of the fertilizer in the soil was very slow and 48 days elapsed after application before P^{32} was found in irrigated soil 10 cm. away from the treated band. Root regeneration was also slow, owing, probably, to high temperatures and low soil moisture, and the lengths of the new roots on 5 August were 15–20 cm. under irrigation and 10–15 cm. without irrigation. The P^{32} content of the roots decreased with increasing distance from the place of application. Analysis of the aerial parts showed that more P^{32} was found in the berries than in the leaves. When a single root of a plant was placed in a box containing soil to which labelled superphosphate was added, P^{32} was noted in the leaves on the 8th day and thereafter the leaf content increased. Although leaves of some branches showed greater radioactivity than those of others, the nutrient was found to be translocated throughout the plant.

430. WEAVER, R. J., AND MCCUNE, S. B.
Effects of overcropping Alicante Bouschet grapevines in relation to carbohydrate nutrition and development of the vine.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 341-53, bibl. 10, illus.

Alicante Bouschet vines were differentially cluster-thinned in 1957, so that one series bore a normal crop and another bore a high crop. The fruit maturation of the overcropped vines was delayed and the juice was of a poorer colour. There was less accumulation of available carbohydrates in the basal shoot segments and roots of overcropped vines. In the dormant season there was less starch in all segments of the overcropped vines. Weight of tops, pruning weights and trunk diameters were usually less in overcropped vines; therefore on a per vine basis the difference in food reserves between vines bearing a normal and a high crop were even greater than was shown by the percentage composition figures. In June of the year following overcropping the percentage of available carbohydrates was lower in the overcropped vines than in the vines that had borne a normal crop. After 2 seasons of growth (in the autumn of 1958) the unthinned, overcropped vines were so weakened that they produced only about half the yield of the thinned vines.—Univ. Calif., Davis.

431. ALLEWELDT, G.
Untersuchungen über den Austrieb der Winterknospen von Reben. (**Studies on the bursting of winter buds in vines.**)
Vitis, 1960, **2**: 134-52, bibl. 30.

Winter buds are formed early in summer but they remain dormant until the following spring. Bud burst was studied in one- and two-year-old vines (vegetative buds) and in one- and two-bud cuttings of older vines (generative buds). The experiments, which were carried out in a glasshouse and under controlled light conditions, produced the following results: The bursting of winter buds was inhibited before the period of endogenous dormancy set it. The inhibition proceeded from the tip of the shoot. The duration of the period of endogenous dormancy, though specific for individual varieties, was about 8 weeks (mid-August to mid-October). With all varieties short days led to a premature inhibition of bud burst only after prolonged treatment. Day length was not responsible for the onset of endogenous dormancy. Low temperatures (below +5° C.) were not necessary for the breaking of endogenous dormancy. The post-dormant period was not shortened by cold. The inhibiting action of GA was specific for individual species and varieties [see *H.A.*, 29: 3359] and was affected by the time of application and the dosage. Dormancy was broken by Rindite (an ethylenechlorohydrin preparation) applied at the rate of about 3–5 mg. per bud. The possible relationship between endogenous and photoperiodically-induced dormancy is discussed.—BundesforschAnst. Rebenzücht., Geilweilerhof.

432. HUGLIN, P.
Untersuchungen über die Knospenfruchtbarkeit der Reben mit besonderer Berücksichtgung ihrer Beziehungen zu den Unterlagen. (**Studies on the fertility of vine buds, with special reference to their relationship with the rootstock.**)
Weinberg u. Keller, 1960, **7**: 127-37, illus.

The fertility of winter buds of vines (i.e. those formed in early summer but remaining dormant until the spring [see previous abstract.]) is discussed in relation to their time of differentiation, the variety and the rootstock. [See also *H.A.*, 29: 2235.]

433. COOMBE, B. G.
Relationship of growth and development to changes in sugars, auxins, and gibberellins in fruit of seeded and seedless varieties of *Vitis vinifera*.
Plant Physiol., 1960, **35**: 241-50, bibl. 34, illus.

Measurements were made of growth and development of certain parts of the fruit and seed of 2 seeded and 3 seedless varieties of *Vitis vinifera* (European grape) from anthesis to maturity. These were compared with changes in the sugar concentration of the juice and the levels of auxins and bberellins in partially-purified extracts of berries. he fruit of all varieties showed a double-sigmoid rowth curve. In the 2 seeded varieties, the first rowth cycle was paralleled by a rise and fall in eristematic activity in the seeds and in the auxin ontent of the berries. In the seedless berries, the rst growth cycle was greater than would be xpected from the berry's auxin content and the eed's meristematic activity. This may be explained y the discovery of gibberellin activity in the young erries of the 3 seedless varieties. No gibberellin ctivity was found in seeded berries at any time. hese findings, plus the fact that berries of seedless arieties enlarge considerably after treatment with bberellin, auxin, and by girdling, whereas seeded arieties do not, suggest that gibberellins are nportant hormones in the fruit of these seedless arieties. Mature stamens of all varieties showed bberellin activity. The second growth cycle ould not be correlated with morphological, auxin, r gibberellin changes but could be related to the flux of sugars into the berries. It is suggested that ugaring causes this growth cycle by an osmotic ttraction of water. A second rise in auxin level as found to reach a maximum in 4 varieties at e beginning of sugaring. These events may be elated but no explanation can be given for this henomenon. Trunk girdling of 2 seedless varieties aused no measurable change in auxin or gibberel- n concentration expressed on dry weight, fresh eight, or volume bases, but levels per berry ncreased because of the large increase in berry olume after girdling. [Author's summary.]—niv. Calif., Davis.

434. **Weaver, R. J., and McCune, S. B.**
Further studies with gibberellin on *Vitis vinifera* grapes.
Bot. Gaz., 1960, **121**: 155-62, bibl. 21, illus.

lowering clusters of Black Corinth and Thompson eedless grapes at berry-shatter stage were dipped n GA_1 or GA_3 at various concentrations. Response o each compound was about equal, as judged by reater berry size in both varieties. GA_3 and KGA_3 concentrations of 0, 5, 20 or 50 p.p.m. were eparately applied to Thompson Seedless at shatter age by dipping clusters or spraying vines. The ompounds were about equally effective in inducing arger berries. In dipping and/or spraying experi- ents Black Corinth, Hunisa and Ohanez showed o greater response to KGA_3 and 4-CPA in combin- tion than to either compound applied separately. arignane clusters at prebloom stage were dipped n KGA_3 in the range 0–100 p.p.m. Pollen erminability was markedly decreased by KGA_3 at –100 p.p.m. and was nil at 100 p.p.m. Treatment ith KGA_3 at 100 p.p.m. resulted in more berries ith a single seed and fewer with 3 or 4 seeds. erminability of pollen obtained from Carignane lusters that had received no chemical treatment was markedly reduced by KGA_3 solutions at 1–25 p.p.m., indicating that the compound can act as a pollenicide. Emasculated flowers on girdled or ungirdled vines of Black Corinth, Thompson Seedless and Tokay received applications of KGA_3 and 4-CPA. Girdling resulted in fruit set in emasculated flowers of Black Corinth, and a good set on ungirdled canes followed treatment with KGA_3 or 4-CPA. Emasculated Thompson Seedless flowers failed to set fruit, whether the canes were girdled or ungirdled, but treatment with KGA_3 or 4-CPA resulted in setting of fruit. In Tokay, a seeded variety, application of either KGA_3 or 4-CPA enhanced the fruit set from emasculated flowers on ungirdled vines. [Authors' summary.—For earlier work see *H.A.*, 29: 3360 and 30: 3504.]—Univ. Calif., Davis.

435. **Weaver, R. J.**
Gibberellins on grapes.
Calif. Agric., 1960, **14** (5): 3.

Better set in Black Corinth, larger berries in Thompson Seedless, looser clusters in compact varieties, earlier flowering and ripening, and retarded bud-break in spring.—Univ. Calif., Davis.

436. **Weaver, R. J.**
Toxicity of gibberellin to seedless and seeded varieties of *Vitis vinifera*.
Nature, 1960, **187**: 1135-6, bibl. 5.

In 5 seeded varieties, represented by Red Malaga, GA at 5 or 25 p.p.m., applied in 1957, decreased shoot and cluster counts and crop weight in 1958. The vines recovered in 1959. By contrast the seedless varieties Thompson Seedless and Black Corinth showed no toxicity symptoms. Two plants sprayed with GA at 100 and 1000 p.p.m. also showed no visible injury.—Univ. Calif., Davis.

437. **Katar'jan, T. G., Drboglav, M. A., and Davydova, M. V.**
The effect of gibberellic acid on different varieties of vine. [Russian.]
Fiziol. Rast., 1960, **7**: 345-8, bibl. 6, illus.

GA, used at 5–500 mg./l., increased berry size in 3 varieties of bisexual seedless grapes but had no effect on one variety. In 2 normal bisexual varieties the size of one was not affected and that of the other was reduced. In 2 varieties with functionally female flowers treatment with GA reduced the size of berries from open pollination but produced larger seedless fruit from flowers shielded from foreign pollen. The sugar content in some varieties was increased by GA, whereas in others it was reduced.

438. **Manankov, M. K.**
The effect of gibberellic acid on the fruiting of vine varieties with functionally female flowers.
[Russian.]
Fiziol.Rast., 1960, **7**: 350-4, bibl. 9.

The use of growth stimulators on vine varieties with functionally female flowers. [Russian.]
Vinodelie i Vinogradarstvo, 1960, **20**(3): 28-33, bibl. 5, illus.
Trials with gibberellins in viticulture. [Russian.]
Sadovodstvo, 1960, No. 5, pp. 43-4, illus.

GA was applied once or twice to both open cross-pollinated and isolated inflorescences of 2 vine varieties, either as a spray at 10–15 mg./l. or in powder form at 1, 5, 10 and 15 mg./g. using 3 different carriers. Treatments in which the ash of vine shoots was used as a carrier gave the greatest increase in bunch size and the following results were obtained with this formulation: Two applications were better than one. The highest percentage of fruit set was obtained with the 10 mg./g. rate; the average weight of 100 berries and bunches was greater at the 15 mg./g. rate, but with that concentration the peduncles became excessively brittle. Treatment of isolated inflorescences resulted in total parthenocarpy, but in the open pollinated inflorescences 15 to 20% of the berries had seeds. Maturity was advanced by 15–20 days; sugar and dry matter contents were increased and acidity decreased. In the second paper the author reports the same results with GA, and notes that NAA at 15 mg./l. and 2,4,5-T at 7 mg./l. were ineffective in increasing total yield and bunch weight.

439. Žuravel', M. S., Milovanova, L. V., and Frolov, A. I.
The action of gibberellin on the development of grapes. [Russian.]
Vinodelie i Vinogradarstvo, 1960, **20**(3): 33-8, illus.

Gibberellic acid at 50, 100 or 200 mg./l. increased bunch size and the average weight per 100 grapes in comparison with untreated controls of 4 varieties of seedless grapes. The larger increases were given by the higher concentrations. Increasing the concentration of GA resulted in higher pectin, tannin and colouring matter contents and increased the acidity of the grapes. Their sugar content was unaffected or slightly reduced.

440. Tkačenko, G. V.
The effect of gibberellin on fruiting in the vine variety Čauš. [Russian.]
Fiziol. Rast., 1960, **7**: 348-50, bibl. 3, illus.

In the Čauš vine, which has functionally female flowers, spraying with 0·002% GA produced almost as large berries and bunches as did cross-pollination, and increased the sugar content.

441. Anagnostopoulos, M. N., Bithas, K., and Mavraganis, S.
The influence of ringing and of the hormone 4-CPA on seed formation in Corinth grapes. [Greek, with French summary $\frac{3}{4}$ p.]
Reprint from *Geoponika*, 1960, No. 66, pp. 11-18, bibl. 1.

The trial consisted of 16 different treatments as follows:—(1) ringing and application of 4-CPA before flowering, during full bloom, 5 days and 10 days after full bloom; (2) application at full bloom of 4-CPA at 10, 20, 40 and 80 p.p.m.; (3) ringing the trunk with rings 3 and 6 mm. wide, ringing the branches, ringing the trunk without removal of the bark, ringing the 2-year-old wood; (4) ringing the trunk and at the same time spraying the flowers with 4-CPA at 20 p.p.m. The best yields were obtained by ringing the trunk with 6 mm.-wide rings at full bloom; all the ringing treatments gave better results than the hormone applications. The percentage of berries with seeds was not influenced by the type or position of the ring or by the time of ringing. After the ringing treatments 81% of the berries contained 1 or 2 seeds, whereas after hormone treatment 80% of the berries contained 4 seeds.

442. Graham, E. T.
Apparent photosynthesis, transpiration and growth of Concord grape (*Vitis labrusca* L.) as influenced by some chemicals used in sprays.
Diss. Abstr., 1960, **21**: 15, being *L.C. Card No. Mic.* 60-2156 of 108 pp.

Two concentrations of bordeaux mixture, namely 4 : 4 : 100 and 8 : 8 : 100 (both with a wetter), had no effect on photosynthesis or transpiration of Concord grapes in the glasshouse. Intensive mist dampening of bordeaux-sprayed plants did not induce injury. Foliar necrosis, stunting and depressed apparent photosynthesis were associated with an oil-base spreader-sticker (9 parts summer spray oil, 1 part phthalic anhydride of glycerol alkyl resin) when applied alone or with bordeaux mixture. No growth response or foliage damage was associated with ferbam plus the spreader-sticker or the emulsifier alone. A single spray of the oil alone in water induced leaf chlorosis but did not affect growth. Additional spray treatment studies showed no injurious effects associated with DDT, ferbam or tribasic copper sulphate.—Pa St. Univ.

Vines—pruning and training.

(*See also* 459.)

443. Derkunskaja, M. D., and Makuev, A. M.
The effect of summer pruning on the condition and productivity of vines. [Russian.]
Vinodelie i Vinogradarstvo, 1960, **20**(5): 33-6.

When 5 methods of summer pruning were compared, pinching back the fruiting shoots above the last fully developed leaf during flowering, plus the removal of every second lateral, resulted in the heaviest bunches and the highest yields. Pinching back during the period between the middle and the end of flowering gave better results than pinching back before, at the end of, or after flowering.

444. AL'TMAN, F. F.
Pruning grape vines for mechanized covering. [Russian.]
Vinodelie i Vinogradarstvo, 1960, **20**(4): 21-7, illus.

simplified type of fan pruning, in which the old ruiting wood is pruned off after the vines have been echanically ridged up to a height of 35–40 cm., is escribed and illustrated. After mechanical ncovering in the spring, pruning is completed by electing shoots required for the new season's rowth and fruiting. A big saving in manual abour in the vineyard is claimed, and the ridging nd uncovering machines are described and lustrated.

445. VALAT, C.
Essai de taille et de palissage dans le vignoble de la Haute-Savoie. **(An experiment in pruning and training in the Haute-Savoie vineyard.)**
Progr. agric. vitic., 1960, **154**: 71-8, bibl. 2, illus.

roduction was increased without deterioration of uality in the wine grape variety Altesse by changing rom the usual system of training on posts to raining along 2 wires. Excellent results were iven by a "flat Guyot" form, bearing a maximum f 16 active buds on 2 long and 2 short shoots, nstead of 8–9 such buds on 4 long shoots. This ystem reduced pruning to a minimum.

446. ŠVÁSTA, J.
Zhodnocení výsledků pokusů s novými způsoby pěstování révy vinné na Moravě. **(An evaluation of experimental results on new methods of vine growing in Moravia.)** [Russian and German summaries 8 lines each.]
Acta Univ. Agric., Brno, Ser. A, 1959, Special No., pp. 159-65, bibl. 10, illus.

Methods of high training showed many advantages.

Vines—soil management, irrigation and nutrition.

(*See also* 112, 162, 282, 429.)

447. SCHRATT, H., AND OTHERS.
Mécanisation rationnelle de la plantation et de la culture de la vigne. Rapports nationaux. **(Economic mechanization of vine planting and cultivation. National reports.)**
Bull. Off. int. Vin, 1960, **33**(353): 3-21, (354): 3-24, (355): 3-20, (356): 26-40.

From (a) Austria, Bulgaria and Spain, (b) France, c) Algeria, Greece and Hungary, and (d) Italy. For reports from Germany and Argentina see H.A., 30: 5073.]

448. CEJKO, A. I.
Vineyard irrigation in relation to the quality of the wine produced. [Russian.]
Vinodelie i Vinogradarstvo, 1960, **20**(5): 24-7.

To increase the productivity of vineyards without reducing wine quality, irrigation based on the following formula is recommended: $W = HV(P - p)\,100$, where $W =$ rate of irrigation in cu.m./ha.; $H =$ depth of the rhizosphere in m.; $V =$ weight per unit volume of soil; $P =$ field capacity in percent of dry weight of soil; and $p =$ soil moisture content before irrigation in percent of dry weight. Irrigation should be discontinued 12–15 days before the technical maturity of vine varieties used for table wines and champagne and 25–30 days before that of varieties used for dessert and heavy wines. [See also *H.A.*, 29: 1206.]

449. BUŠIN, P. M.
The water requirement of the vine during different stages of growth. [Russian.]
Vinodelie i Vinogradarstvo, 1960, **20**(5): 28-30.

In Uzbekistan vineyards with a yield of over 250 centners/ha. the water consumption of vines during the growing period totalled up to 11,000 cu. m./ha. The least amount, 1·5% of the total, was used from the beginning of growth to flowering, during which period the average daily consumption was only 14·6 cu. m./ha. Between the beginning of flowering and fruit set the corresponding values were 10% of the total and 95 cu. m./ha., during fruit growth 43% and 100 cu. m., and during ripening 45% and 100 cu. m. at first, declining to 40–45 cu. m./ha. The methods by which the leaf area and the rate of transpiration were estimated are described, and the need for the provision of water is demonstrated.

450. HAUSENBUILLER, R. L., AND CLORE, W. J.
The use of green manures and cover crops in nutrition control in central Washington vineyards.
Proc. Wash. St. hort. Ass., 1959, pp. 122-6, bibl. 2.

Approximately 55 lb. of N is released in the first year after ploughing-in a crop of vetch, but this, together with the 10–20 lb. N mineralized each year in Washington soils, is not sufficient to supply the needs of productive vineyards. Most Washington soils can supply adequate amounts of P and K for the vine crop, but where a vetch crop is grown extra P and K fertilizer may be required to ensure maximum fixation of N by the vetch.—Irrig. Exp. Stat., Prosser, Wash.

451. LEVINSKIJ, A. I.
The effectiveness of organo-mineral fertilizers in vineyards. [Russian.]
Agrobiologija, 1960, No. 2, pp. 202-4.

Irrigated vines were fertilized in 3 different ways: (1) with NPK mineral fertilizers, (2) with 5 tons compost/ha. + NPK fertilizers, or (3) with 25 tons half-rotted dung/ha., and yields were compared with those from unfertilized control plants. The greatest increase in yield was given by treatment 2, but treatment 3 had a better after-effect reflected in increased yields during the years following the treatment. Both treatments with organic fertilizers increased the numbers of bacteria found in the soil during the growing period.

452. NEKRASOVA, A. A.
The effect of organo-mineral granulated fertilizers on vine yields. [Russian, with French and Moldavian summaries.]
Izv. Mold. Fil. AN SSSR, 1957, No. 2-3, pp. 97-104, from *Ref. Ž.* (*Biol.*), 1958, No. 23, Abstr. 104,819.

In a 3-year trial organo-mineral fertilizers in powder form increased vine yields by 11–26% and in granulated form by 32–58%. Granules 1 cm. in diameter were the most effective. The rate of fertilizer application can be reduced by half by use of the granulated form instead of the powder form. In the first year after application the number of fruiting branches increased and the inflorescences were better developed, and in the second and third years both the number of inflorescences and the number and weight of berries and bunches increased.

453. ARUTJUNJAN, A. S., AND OTHERS.
Vine nutrition and wine quality. [Russian, with English and German summaries.]
Vest. s.-h. Nauki, 1957, **2**(10): 87-98, from *Ref. Ž.* (*Biol.*), 1958, No. 23, Abstr. 104,836.
Fertilizing vineyards as a means of improving the quality of the wine. [Russian.]
Vinodelie i Vinogradarstvo, 1960, **20**(3): 24-7.

Experiments were conducted on the effect of fertilizers on wines from 4 vine varieties. A definite relationship was established between the quantity of aromatic compounds and the P content of the berries. Mineral fertilizers in mixtures with FYM increased yields and quality of the wine. K improved the flavour and colour of the wine, but at the same time it tended to reduce acidity. N at moderate rates improved wine quality but at excessive rates reduced it. Wines with a high content of N compounds tended to become cloudy. While cloudiness reduced the quality of table wines, it did not matter for brandy wines, and N compounds improved the quality of the spirit. Sugars accumulated rapidly at the beginning of ripening, whereas the accumulation of aromatic compounds was slower at first but continued for a longer period; grapes should therefore be picked at full maturity, whether for dessert, table wines or brandy wines.

454. BERGMAN, E. L., AND OTHERS.
Growth of Concord grapes in sand cultures as related to various levels of essential nutrient elements.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 329-40, bibl. 19.

Low levels of nutrient depressed dry weight accumulation in the following decreasing order: K, N, Ca, P, B, Mg, Zn, Mn, Mo. High levels depressed dry weight in the following decreasing order: K(Cl), Mg, $Ca(SO_4)$, Ca(Cl), N, P, $K(SO_4)$, Fe, B, Mn. The 5Mo treatment resulted in the greatest dry weight accumulation by the plant. Linear growth was depressed by deficient levels of nutrients in the following decreasing order: N, K, P, Ca, B, Cu, Zn, Mo, Fe, Mn, Mg. High levels of nutrients were depressing in the following decreasing order: Mg, Ca, K(Cl), $Ca(SO_4)$, N, Fe, Mn, Mo, Zn, $K(SO_4)$, Cu, B. The check treatment resulted in the greatest linear growth, with the 5P treatment a close second. It was impossible to grow plants without N for longer than 3 weeks. Mg deficiency symptoms appeared more quickly on plants given high K treatments than on those treated with Mg-deficient solutions. Visible deficiency symptoms on plants, as described, were associated with the following nutrient levels in the petioles: N 0·51%, P 0·10%, K 0·47%, Ca 0·26%, Mg 0·14%, Mn 18 p.p.m., B 14 p.p.m., Cu 2 p.p.m. and Zn 11 p.p.m.—Mich. agric. Exp. Stat.

455. NAITŌ, R., OZUKA, T., AND TOBITANI, A.
Studies on the magnesium nutrition of grape vines on soils in a sandy hill region. [Japanese, with English summary $\frac{1}{2}$ p.]
J. hort. Ass. Japan, 1960, **29**: 55-62, bibl. 18.

Vines of the variety Delaware were grown in pots containing a Mg-deficient soil and treated with a basic nutrient solution and different concentrations of Mg. With non-bearing vines Mg levels of 20, 40 and 80 p.p.m., especially the last, were desirable; with bearing vines the higher the level, up to 160 p.p.m., the better was the growth, although differences were small. Yield and bunch size were greatest at 20 p.p.m., decreasing slightly as the concentration increased. Mg deficiency was not found in non-bearing vines at 20 p.p.m. and above, but appeared in bearing vines at levels up to 80 p.p.m. A reciprocal relationship between the Mg and K contents was noted in the leaves of the non-bearing vines and a similar correlation appeared between the exchangeable Mg and K in the soil. It is suggested that this relationship may account for the reduced yield of berries at higher Mg concentrations.

456. REFATTI, E.
Clorosi riprodotte per innesto nella vite e clorosi da ferro-carenza nella vite e in altre specie vegetali: Nota 1. **(Chlorosis reproduced by grafting in the vine, and iron deficiency chlorosis in the vine and other plants. Note 1.)** [English summary 2 pp.]
Ann. Fac. Agrar. Milano, 1957 (issued 1958), **6**: 89-143, bibl. 55, illus.

A comprehensive review of relevant Italian and other work on the numerous chloroses of the vine caused by iron deficiency and virus diseases.

457. Yoneda, S., Kōchi, T., and Yanai, M.
Studies on the chemical composition of glasshouse vine soils, with special reference to the accumulation of excess soluble salts in the soils. II. On the changes in salinity and nitrate contents of glasshouse vine soils. [Japanese, with English summary 1 p.]
Sci. Rep. Fac. Agric. Okayama Univ., 1960, No. 15, pp. 33-42, bibl. 2.

Old glasshouse vine soils were found to resemble semi-arid-zone soils in containing abnormally high contents of Ca, NO_3 and SO_4, which scarcely varied seasonally. Replacement of the surface layer with fresh soil markedly reduced these abnormal figures and resulted in increased yields and quality of grapes.

Vines—grape composition.

(*See also* 423, 429, 433, 437, 439, 440, 453, 460.)

458. Colagrande, O., and Grandi, G.
Contributo allo studio dei pigmenti antocianici dell'uva. (**Anthocyanin pigments in grapes.**) [English summary ½ p.]
Ann. Sper. agrar., 1960, **14**: 325-37, bibl. 12, illus.

Using chromatographic methods, which are described, the authors were able to isolate a number of pigments, including delphinidin, malvidin, petunidin, cyanidin and peonidin, in the red grapes of 5 vine varieties. These broke down under acid hydrolysis into fructose and either galactose or glucose.—Univ. Cattol. S. Cuore, Piacenza.

459. Mel'nik, S. A.
Methods of increasing the sugar synthesis of vines. [Russian.]
Tr. Odessk. s.-h. In-ta, 1957, **8**: 40-8, from *Ref. Ž.* (*Biol.*), 1958, No. 23, Abstr. 104,800.

No direct relationship was found between the number of bunches per vine and the sugar content of the juice. Bending the fruiting shoots to 150–180°, ringing the shoots and banding the base of the shoots with wire 2 weeks before physiological maturity all increased the sugar content of the berries by 3–5%. Ringing the main trunk was less effective and reduced vigour, as did regular annual banding of the shoots with wire. Sugar content was also increased by pinching back the shoots, removing the laterals in vigorous varieties, removing the tendrils and twisting the bunches. The sugar : acid ratio was strongly affected by the method of training; shaping the bush according to the needs of the individual variety improved conditions for sugar accumulation.

Vines—grape harvesting, storage and drying.

(*See also* 111.)

460. Remoue, M.
Contrôle de maturité dans le Gard. (**Determining grape maturity in the Gard area.**)
Progr. agric. vitic., 1960, **154**: 102-7.

The region is divided into 5 smaller sections, in each of which certain control vines of different varieties are selected for analysis of samples of grapes and must. The results are published within 48 hours of sampling, and give a good indication of the number of days that should elapse before harvesting. The sugar content and total acidity of the juice, and the degree of alcoholic potency of the must are the criteria.

461. Dyment, R.
The shaker.
Amer. Fruit Gr, 1960, **80**(9): 16, illus.

A prototype mechanical grape picker has been developed by Cornell University Agricultural Engineering Department. The 3-wheeled machine actually shakes the grapes off the vine. It has a forward-mounted motor just behind the single chain-driven front wheel which also steers. The rear wheels are widely spaced, and the controls and operator's seat are in the centre 8 ft. above the ground. The shaker hook extends down to the right of the driver and can be moved up and down or sideways. Once the hook is properly positioned under the taut top wire of the trellis, the shaker bar is activated, and grapes within a 3- to 4-ft. radius fly off and are caught in a canvas trough.

462. McGlasson, W. B.
Grapes out of season.
J. Agric. S. Aust., 1960, **63**: 452-4.

Ohanez, Black Malaga, Muscat Gordo and Malaga (Waltham Cross) grapes were stored successfully for 3–6 months, according to variety, when placed in a cool store at 31–32° F. within 24 hours of picking. Trimming bunches is recommended before the fruit is stored, and fumigation every 7 days with sulphur dioxide is essential to prevent mould.

463. Aref, M.
The sun-drying of Egyptian fruits. 1. Grapes (*Vitis vinifera*).
Alexandria J. agric. Res., 1959, **7**: 89-102, bibl. 13, from *Trop. Abstr.*, 1960, **15**, Abstr. h2116.

In experiments with Thompson Seedless, Muscat of Alexandria and Rozaki the rate of drying was determined, using the Zeiss hand refractometer. Exposure to the fumes of burning sulphur accelerated the drying rate slightly and improved the colour. Dipping for 5 seconds in a boiling 0·5% NaOH solution speeded up drying rates from 24, 27 and 25 days to 13, 18 and 17 days for the above-mentioned varieties, respectively. The higher the initial soluble solids content the lower was the drying rate and consequently the greater the yield. Upon re-hydration the raisins absorbed about their own weight of water in 1 hour. Drying to a moisture content of 15·5% was found to be very satisfactory for storage, even for periods exceeding 6 months.

Temperate nuts.

(*See also* 125, 201, 221, 297, 310, 311, 316.)

464. SCHANDERL, H.
Blütenbiologische Untersuchungen an deutschen Mandelsorten. (**Flower biology investigations on German almonds.**)
ErwObstb., 1960, **2**: 167-9, bibl. 17.

Of 23 almond varieties received from the Palatinate, the Bergstrasse and the Rhineland, 19 were found to be markedly self-sterile and 4 self-fruitful. The latter showed hybrid characters and are probably peach × almond hybrids. One instance was noted of inter-sterility between two varieties. Generally speaking the fruiting almond demands milder conditions than Germany can provide.

465. CRESCIMANNO, F. G.
Ricerche sulla biologia fiorale di alcune cultivar di mandorlo premici coltivate in Sicilia. (**Investigations on the floral biology of some soft-shell almond varieties cultivated in Sicily.**) [French and English summaries 13 and 11 lines.]
Riv. Ortoflorofruttic. ital., 1960, **44**: 13-23, bibl. 29, illus.

Of 6 varieties studied Cavaliera, Mollese da tavola, Mollese pizzuta, Pistacchio and Mollisetta are virtually self-sterile (but the first 3 and the last 2 cross-pollinate) and Mollisona is self-fertile. Phenological data are given.

466. MCKAY, J. W.
Seed and seedling characters as tools in speeding up chestnut breeding.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 322-5, bibl. 4.

Some effects of pollen source on colour, etc., of seeds or seedlings.

467. DE ROSA, M.
Varietà di nocciuolo. (**Hazel nut varieties.**)
Progr. agric., 1960, **6**: 808-14, illus.

For each of the 8 varieties described, the composition figures are given for moisture, proteins, fats, carbohydrates, minerals, Ca, Fe and P. Average figures for all the varieties are given for vitamins A and B_1.

468. SHARPE, R. H. AND GAMMON, N., JR.
Pecan growing in Florida.
Bull. Fla agric. Exp. Stats **601**, revised 1958, pp. 67, bibl. 18, illus.

Varieties, orchard establishment, culture, propagation, marketing.

469. ROBERTSON, W. K., GAMMON, N., JR., AND HORN, G. C.
Effect of placement of fertilizer and lime on pecan seedlings.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 317-20, bibl. 5, illus.

On a flatwood soil with a mottled or heavy-textured layer starting at a depth of about 20 in. dolomite and a 4–12–12 fertilizer applied at a depth of 10 to 20 in. improved the stand and diameters at ground level of pecan seedling rootstocks. Dolomite alone was almost as effective as the combined treatment, but fertilizer alone gave poorer results.—Fla agric. Exp. Stat., Gainesville.

470. SMITH, C. L., HARRIS, O. W., AND HAMMAR H. E.
Comparative effects of clean cultivation and sod on tree growth, yield, nut quality, and leaf composition of pecan.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 313-21, bibl. 1.

The yields of Schley and Success pecan trees growing in Dallis grass sod with annual applications of 500 lb. of 6–0–0 or 6–8–6 fertilizer per acre were lower than those of similar trees cultivated in summer but with winter-legume cover crops turned into the soil each spring, with or without annual applications of 500 lb. of 6–8–6 fertilizer per acre. Growth of both varieties was retarded by the sod. The introduction of winter-legumes into the Dallis grass sod increased the N status of the soil and improved growth and yields. The P content of the leaves was relatively high in years of low crops and relatively low in years of heavier crops. It was higher in leaves of trees growing in sod than in leaves of cultivated trees. There were no apparent effects of cultural treatments or fertilizers on the K, Ca or Mg contents of the leaves.—U.S. Dep. Agric., Shreveport, La.

471. LARUE, M.
Le pistachier en Iran. (**The pistachio in Iran.**)
Fruits d'Outre Mer, 1960, **15**: 139-42, bibl. 1.

The paper discusses species (*Pistacia vera*, the most common, which is also used as a rootstock and prefers deep, light alkaline soil, *P. mutica* and *P. khinjuk*); cultural practices (cleft grafting in the field, spacing at 6 × 6 m., cultivation, training and pruning); pollination; irrigation; yields (averaging 20–30 kg. dry fruit per tree); and pests.

472. ZATYKÓ, I.
A diógyökereztetési kísérletek újabb eredményei. (**New results in walnut rooting experiments.**) [Russian and German summaries 8 lines each.]
Kísérl. Közlem., Sect. C, 1959, **52C**(2): 131-6, bibl. 10, illus.

See *H.A.*, 30: 1901.

PLANT PROTECTION OF TEMPERATE FRUITS.

General.

473. ANON.
1960 spray recommendations for tree fruits in eastern Washington.
Ext. Bull. Wash. St. Univ. **419**, revised 1960, pp. 36.

A comprehensive review of recommended herbicides, pest and disease control programmes, and thinning, hormone and nutritional sprays for pome and stone fruits.

474. FOSCHI, S.
Note di fitoiatria. I mezzi di lotta contro i parassiti delle piante. (**Plant pathology notes. Control measures against plant parasites.**)
Publ. Minist. Agric. For., Osserv. fitopat., Bologna, [undated], pp. 42, illus.

A semi-popular booklet on sprays, dusts, additives, and their uses in controlling pests and diseases.

Disorders of non-parasitic or uncertain origin.

(*See also* 239, 240, 267, 289, 330, 344, 345, 349, 456, 511.)

475. ŠARIĆ-SABADOŠ, A., AND SEIWERTH, V.
Olovna bolest breskve u području sjevernog jadrana. (**Silver leaf disease of peach trees in the Northern Adriatic.**) [English summary 8 lines.]
Zasht. Bilja, 1959, No. 54, pp. 87-92, bibl. 20, illus.

This so-called late silver leaf disease is non-parasitic and is characterized by the formation of calcium oxalate crystals in the leaves due to a profound physiological disturbance. The causes of the disease are discussed.—Univ. Zagreb.

476. BÖRNER, H.
Neuere Ergebnisse über die Ursachen der Bodenmüdigkeit beim Apfel (*Pyrus malus* L.). (**Recent data on the causes of soil sickness in apple nurseries.**)
ErwObstb., 1960, **2**: 191-9, bibl. 41, illus.

A review, suggesting that more attention should be paid to the soil microflora.

Viruses.

(*See also* 291, 456.)

477. POSNETTE, A. F.
The economic importance of virus diseases of fruit trees in England.
N.A.A.S. quart. Rev., 1960, No. 48, pp. 170-5, bibl. 15.

A review of the effects of the most severe and most prevalent virus diseases affecting cherry, plum, apple and pear. Few data are yet available on losses caused by viruses, but work at East Malling has shown the effect on cherry yields [*H.A.*, 30: 3531.]. The virus diseases of fruit trees are grouped into 4 categories: (a) those which are of local importance but which would cause severe losses if they became prevalent, e.g. stony pit of apple; (b) those of importance because they probably reduce yield by 20% or more and are already prevalent, e.g. necrotic ring spot of cherry; (c) those of importance only in a limited range of varieties, e.g. rubbery wood in apples; and (d) those which now seem unimportant in Britain, e.g. green mottle and other latent viruses in plums.

478. GILMER, R. M., AND BRASE, K. D.
Relative infection potentials of rootstock and scion in increasing virus incidence in the fruit nursery.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 188-94, bibl. 2.

See *H.A.*, 30: 5110.

479. REEVES, E. L., AND LINDNER, R. C.
Some apple virus disease problems in Washington.
Proc. Wash. St. hort. Ass., 1959, pp. 117-19, bibl. 3, illus.

Symptoms of the following diseases which occur in Washington are outlined: apple mosaic, russet ring, flat limb, stem pitting, star crack and rubbery wood.

480. CATION, D.
Dwarf fruit and tree decline, a virus disease of apple.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **42**: 722-7, bibl. 10, illus.

On Hyslop, by graft transmission from symptomless Jonathan.

481. WELCH, M. F., AND KEANE, F. W. L.
The virus disease "leaf pucker" of apple and associated fruit symptoms.
Proc. Wash. St. hort. Ass., 1959, pp. 114-16, bibl. 1, illus.

Puckering and chlorotic flecks on the foliage and small depressed areas with abnormal pigmentation and superficial ring-russet patterns on the fruit have been produced by graft inoculation in McIntosh and Spartan but not yet in Jonathan or Winesap.

482. REEVES, E. L., AND CHENEY, P. W.
Russet-ring, a graft transmissible disease on Golden Delicious apples.
Proc. Wash. St. hort. Ass., 1959, pp. 157-8, illus.

Symptoms of a new virus disease are described: russeting was more severe in a cool season than in a hot summer.

483. STARCHER, D. B.
The economic importance of russet ring on Golden Delicious apples.
Proc. Wash. St. hort. Ass., 1959, pp. 120-1.

More than 1,000 trees in Washington are thought to be infected, some only partially and some with 100% of the fruit marked. Down-grading of fruit due to russet ring can cause a 20% reduction in market value.

484. McCrum, R. C., and Hilborn, M. T.
Hardy apple stocks and virus diseases.
Me Fm Res., 1960, **8**(1): 3-6, illus.

Seedlings of Antonovka were first budded with healthy Virginia Crab free from stem-pitting, and then with Baldwin buds from healthy and stem-pitted trees inserted just beneath the healthy Virginia Crab buds. Seedlings inoculated with infected buds developed stem-pitting symptoms, showing that the disease was carried in a latent form in the Baldwin buds. In several cases where the Baldwin buds from pitted trees did not take, stem-pitting still developed in the shoots above, thus showing transmission of the virus. [See also *H.A.*, 29: 2269.]

485. Rui, D.
Precisazioni sul mosaico del pero. (**Details of pear mosaic.**)
Not. Mal. Piante, 1960, No. 52, pp. 3-6, illus.

Symptoms on the Kaiser pear variety are described. No effect has been noted on yield or quality of fruit.

486. Drijfhout, E.
Een nieuwe virusziekte bij peren? (**A new virus disease of pears?**)
Fruitteelt, 1960, **50**: 993-5, illus.

Trees of the pear variety Doyenné du Comice, with Quince A as rootstock and Hardy as interstock, developed spirally flattened and groved trunks with vertical fissures 15–20 cm. in length, and abnormally large lenticels. Spongy swellings formed on the trunk and main branches, the outer tissues dying but the wood remaining sound. On the smaller branches such lesions sometimes healed naturally by overgrowth of new bark. Leaf development was poor and many of the buds dried out and died. A virus infection is suspected.

487. Klos, E. J., and Parker, K. G.
Yields of sour cherry affected by ring spot and yellows viruses.
Phytopathology, 1960, **50**: 412-15, bibl. 9.

Trees with ring spot symptoms yielded less than healthy trees in the first year of infection. In the following year yield was in one case equal to that of healthy trees; in another, yield was not equal to that of healthy trees until the second year after the symptoms appeared. Yield of yellows-affected trees was lower than that of healthy trees in the years succeeding that in which the symptoms first appeared. Trees with yellows had longer terminals and larger fruit than trees free of yellows. Trees infected with ring spot or yellows did not differ from healthy trees in trunk circumference growth or total solids content of the fruit.—Cornell Univ., Ithaca, N.Y.

488. Schuch, K.
Virusbedingte Fruchtschäden bei Zwetschen und Aprikosen. (**Virus damage to fruits of damsons and apricots.**)
Reprint from *Rhein. Mschr. Gemüse-, Obst- u. Gartenb.*, 1960, No. 7, pp. 2, illus.

Symptoms and effects of plum pox are described.

489. Stace-Smith, R.
Current status of bramble viruses.
Canad. Plant Dis. Survey, 1960, **40**(1): 24-42, bibl. 51.

A world-wide review, covering mode of transmission, types of viruses, their vectors, and trends in their control, particularly on raspberries, by breeding for resistance to both viruses and vectors and by heat therapy.

490. Stace-Smith, R.
Studies on *Rubus* virus diseases in British Columbia. VI. Varietal susceptibility to aphid infestation in relation to virus acquisition.
Canad. J. Bot., 1960, **38**: 283-5, bibl. 3.

Field populations of the large raspberry aphid, *Amphorophora rubi* (Kalt.), were observed for 4 years on 13 varieties of raspberry. Lloyd George and St. Walfried were immune, Malling Enterprise and Malling Promise were resistant, and the remainder were susceptible to infestation. Each variety was naturally infected with black raspberry necrosis virus. Vector studies demonstrated that this virus was acquired with difficulty from the immune varieties and also from the susceptible variety St. Regis, but was readily acquired from the remaining 10 varieties. [Author's abstract.—For earlier work see *H.A.*, 27: 3267.]—Canada Dep. Agric., Vancouver, B.C.

491. Mellor, F. C., and Forbes, A. R.
Studies of virus diseases of strawberries in British Columbia. III. Transmission of strawberry viruses by aphids.
Canad. J. Bot., 1960, **38**: 343-52, bibl. 21.

Eleven aphid species commonly found on rosaceous plants were tested as vectors of 8 strawberry viruses. *Amphorophora rubi*, *Aphis rubifolii*, *Aulacorthum solani*, *Macrosiphum rosae*, *Myzus ascalonicus*, *M. ornatus*, *M. persicae*, *Pentatrichopus fragaefolii*, *P. tetrarhodus and P. thomasi* transmitted the vein banding virus from one or both of 2 sources. *P. fragaefolii*, *P. tetrarhodus* and *P. thomasi* transmitted mild mottle, while only *P. fragaefolii* and *P. thomasi* transmitted curly-dwarf mottle. *M. rosae* transmitted vein banding and possibly mild yellow edge. *Aphis forbesi* failed to transmit any of the viruses tested. None of the species tested transmitted witches' broom, crinkle or strawberry latent-A virus. [From authors' abstract.—For part II see *H.A.*, 22: 310].

492. Lister, R. M.
Occurrence of soil-borne virus diseases of strawberry in Britain.
Plant Path., 1960, **9**: 102-5, bibl. 9.

bservations and comments on a survey of the nglish strawberry-growing areas [see also *H.A.*, 9: 5120]. As far as fruit production is concerned il-borne viruses are unlikely to be of direct nportance except in certain localities.—Scot. hort. es. Inst., Mylnefield, Invergowrie.

493. Schöniger, G.
Über die durch das Erdbeernekrosevirus bedingten anatomischen Veränderungen in *Fragaria vesca* L. (**On the anatomical changes in *Fragaria vesca* caused by the strawberry necrosis virus.**)
Naturwissenschaften, 1960, **47**: 189-90, bibl. 3.

rimary anatomical changes may occur in a variety tissues [see also *H.A.*, 30: 3542].

494. Cadman, C. H., Dias, H. F., and Harrison, B. D.
Sap-transmissible viruses associated with diseases of grape vines in Europe and North America.
Nature, 1960, **187**: 577-9, bibl. 17, illus.

he transmission of viruses of both European and .S. origin from grape vines to herbaceous hosts is ported. A new approach is thus possible to the udy of the relationship between the viruses associated with grape vine diseases, particularly those the following 2 groups: (1) fanleaf, Reisigrankheit, urticado, court-noué, and (2) yellow osaic. clorose infecciosa, Panaschüre and anachure.—Scot. hort. Res. Inst., Invergowrie, nd Rothamsted exp. Stat., Harpenden.

495. Ciferri, R., and Corte, A.
Experimental transmission of vine "infectious degeneration" virus and its occurrence on various hosts in Italy.
FAO Plant Prot. Bull., 1960, **8**: 79-81, bibl. 6, illus.

f the limited number of plants outside the Vitaceae which the disease has been transmitted, *Ligustrum cidum* is considered to be an excellent indicator lant [see also *H.A*. 30: 1922] and diagnostic sympoms are described with illustrations. There are dications that tomatoes, *Artemisia campestris, alix alba* and *Ligustrum ovalifolium* act as natural osts.—Univ. Pavia.

496. Saric Sabados, A., and Corte, A.
Dati preliminari su una forma di degenerazione infettiva della vite in Istria a complesso sintomatologico insolito. (**Preliminary data on a form of infectious degeneration of vines in Istria with unusually complex symptom expression.**) [English summary ½ p.]
Atti Ist. bot. Univ. Pavia, 1960, **17**: 268-73, bibl. 9, illus.

Besides the usual symptoms, the Istrian vines showed blistering of leaves which were deformed and cup-shaped, and leaf roll where the leaves were thick and glossy. Another peculiarity, possibly not due to the virus, was cauliflory.

Bacteria.

(*See also* 211.)

497. Crosse, J. E., Bennett, M., and Garrett, C. M. E.
Investigation of fire-blight of pear in England.
Ann. appl. Biol., 1960, **48**: 541-58, bibl. 47, illus.

The first authenticated outbreaks of fire-blight (*Erwinia amylovora*) on pears in Europe occurred in Kent in 1957 [see *H.A.*, 29: 311e]. The symptoms and seasonal course of the disease are described in detail. Pollinating insects (mainly bees), rather than rain, appeared to be the vectors. Laxton's Superb was a highly susceptible variety, whereas Williams' and Conference showed considerable resistance. Other host species are listed. In the climate of Britain blossom infection is more likely in summer than in spring.—East Malling Res. Stat., Kent.

498. Luepschen, N. S.
Fire blight control with streptomycin as influenced by temperature and other environmental factors, and by adjuvants added to sprays.
Diss. Abstr., 1960, **20**: 3917, being *L.C. Card No. Mic.* 60-883 of 91 pp.

The optimum temperature for the growth of *Erwinia amylovora* was 24° C. Studies made on potted pear trees growing in controlled environment chambers and glasshouses have shown that sprays of streptomycin applied before, and 24 hours after, inoculation substantially controlled blossom blight, and that a 100 p.p.m. spray was superior to 2–6–100 bordeaux, especially at lower temperatures. Spraying to simulate rain 30 hours after streptomycin application reduced blight control by one-third. Of various adjuvants tested on pears and apples glycerol and Triton B-1956 were the most promising. The timing and method of application of sprays for field control appeared to be important factors. High R.H. was considered of greater importance than temperature in facilitating penetration. Streptomycin nitrate was slightly superior to the sulphate in controlling blossom blight, and the pectate form was equal to the sulphate in controlling apple shoot blight.—Cornell Univ.

499. Clift, L. F., Hobbis, E. W., and Marsh, R. W.
Highworking of plum trees to control bacterial canker.
Comm. Gr, 1960, No. 3378, pp. 683-5, illus.

The nursery technique for growing Myrobalan B for highworking is described in detail. In a trial at Long Ashton with high-worked plums on this stock, losses from bacterial canker in 8 seasons' growth has been 2 trees out of 152 planted, while comparable losses from low-worked trees were 13 trees. A N.A.A.S. trial in Herefordshire [see *H.A.*, 30:1667] and one at Luddington Experimental Horticulture Station have also shown that bacterial canker may be reduced by high-working on Myrobalan B.

500. Treggi, G.
Azione, in vitro, di alcuni antibiotici su di un ceppo di *Erwinia vitivora* (Bacc) du Plessis agente del "mal nero" della vite. (**The action *in vitro* of certain antibiotics on a strain of *Erwinia vitivora*, the causal agent of blight in vines.**)
Ann. Fac. Agrar. Univ. Pisa, 1959, **20**: 61-3.

Penicillin had no effect, but terramycin and aureomycin were very active, and streptomycin and chloromycetin moderately active, against this bacterial pathogen.

Fungi.

(*See also* 141, 233, 352, 353, 361, 389, 462.)

501. Waugh, N. M., and Byrde, R. J. W.
A note on the possible origin of crotch cankers on apple trees.
A.R. Long Ashton agric. hort. Res. Stat., 1959, 1960, pp. 112-14, bibl. 8, illus.

Observations indicate that crotch canker may arise from injury induced by excessive meristematic activity followed by rupture of the bark in the summer. Fissures are formed in it, which persist during the winter and tend to become waterlogged. Water-borne spores of *Nectria galligena* accumulate at branch junctions and give rise to canker infection.

502. Wartenberg, H.
Studien am Apfelmehltau *Podosphaera leucotricha* (Ell. et Ev.) Salm. mit Berücksichtigung einer normergisch-plasmatischen Abwehrreaktion. (**Studies on apple mildew, *Podosphaera leucotricha*, with reference to a normal plasmatic defence reaction.**) [English summary ½ p.]
Phytopath. Z., 1960, **39**: 1-24, bibl. 137, illus.

In extensive studies on *Malus* spp. and varieties it was possible to determine susceptibility, but not resistance, to apple mildew. The decisive factor determining the intensity of attack was the chance of bud infection. The normal plasmatic defence reaction, interrupting the chain of infection, was a secondary and less constant factor. This reaction, found in the sepals of peach flowers and in 3 *Malus* spp., is described in detail.—Friedrich-Schiller Univ., Jena.

503. Waugh, N. M.
The effect of dinitro-*ortho*-cresol on apple buds in relation to the control of mildew.
A. R. Long Ashton agric. hort. Res. Stat., 1959, 1960, pp. 115-17, bibl. 4.

Following clear indications obtained in experiments at Luddington and at East Malling that the application of DNC resulted in reduced mildew infection, work to elucidate the position was undertaken at Long Ashton. It was found that spraying in the late dormant stage with 0·1% DNC in 3% spindle oil reduced primary mildew infections in the spring. There was evidence that this was due to the killing by DNC of mildewed buds which would otherwise have been a source of infection. In 1959, when bud burst was particularly early, the use of the DNC spray in mid-March caused much damage to healthy buds.

504. Sprague, R.
Control of apple powdery mildew at Wenatchee.
Proc. Wash. St. hort. Ass., 1959, p. 19.

In trials over 11 seasons Karathane plus a wetter-sticker gave very good control when 4 sprays were applied at 10-day intervals starting on 10 April. Dilute sulphur was not effective. Polysulphide Compound gave good control, but an ammoniated polysulphide caused some leaf injury. A new material Niagara 5943 appeared most efficient but somewhat dangerous to the operator.—Tree Fruit Exp. Stat., Wenatchee, Wash.

505. Hoffmann, E.
L'oïdium du pommier et les moyens de le combattre. (**Apple mildew and its control.**)
Rev. hort. suisse, 1960, **33**: 173-6, illus.

With wettable sulphur and Karathane.

506. Ercolani, G. L., and Caumo, B.
Il mal bianco del pero. (**Pear mildew.**)
Progr. agric., 1960, **6**: 577-83, illus.

Control measures against *Podosphaera leucotricha* at present are mainly preventive. Susceptibility can be enhanced by the wrong choice of rootstock: for instance, by quince on calcareous soils or for incompatible pear varieties. Treatments with 0·15–0·2% wettable sulphur have proved satisfactory.

507. Moore, M. H.
Apple rootstocks susceptible to scab, mildew and canker for use in glasshouse and field experiments.
Plant Path., 1960, **9**: 84-7, bibl. 5, illus.

M and MM rootstocks are listed according to their observed susceptibility to scab, mildew and canker in the field and to scab and mildew in the glasshouse. M. VIII, XVI, III, II, MM. 109 and 111 were most susceptible to scab; M. IX, III, IV, I, VIII, MM. 106, 104, 109 and 111 to mildew; and M. VIII and III to canker.—E. Malling Res. Stat., Kent.

08. Csorba, Z.
Almafák kombinált vegyszeres növényvédelme. (**Combined chemical control of apple diseases.**) [Russian and German summaries 1 p. each.]
Kisérl. Közlem., Sect. C, 1959, **52C**(2): 103-29, bibl. 15.

esults are given of trials with 11 spray programmes ainly against mildew and scab, with special nsideration of spray damage.

509. Sprague, R.
Apple scab sprays for 1960 in north central Washington.
Proc. Wash. St. hort. Ass., 1959, pp. 17-18.

ontrol obtained in 1959 with Cyprex, Phygon, aptan and ferbam discussed.

510. Borecki, Z., and others.
Z badań nad skutecznością niektórych środków grzybobójczych przy zwalczaniu parcha jabłoniowego (*Venturia inaequalis* (Cooke) Aderh.) (**The effectiveness of some fungicides for the control of apple scab.**) [English and Russian summaries 1 p. each.]
Prace Inst. Sadown., Skierniewice, 1959, **4**: 235-45, illus.

usceptible 14-year-old McIntosh trees were sprayed times a year, at pink bud, at petal fall, at first over, and 2 weeks later. Copper fungicides roved more effective than sulphur compounds, Kupferkalk Urania at 1% being the most effective. New Polish formulations of copper oxychloride and ordeaux were efficient fungicides but too phytooxic to be recommended for commercial use.

511. van Schreven, A. C., and Vlasveld, W. P. N.
Het schurftonderzoek in Nederland van 1955 t/m 1958. IV. Invloeden van het middel Tuzet op kleur en houdbaarheid van appels. (**Scab research in the Netherlands, 1955-1958. IV. The effects of Tuzet on colour and storage quality of apples.**)
Meded. Dir. Tuinb.,1960, **23**: 459-66, bibl. 3.

Tuzet sprays applied in June and July gave the following results: (i) improved fruit quality and colour with some varieties; (ii) unfavourable effects on leaf condition, and even growth inhibition of Golden Delicious after 5 sprays; (iii) accelerated fruit growth; (iv) increased susceptibility to storage breakdown in Jonathan. No correlation was found between Jonathan breakdown and the K content or K_2O/MgO ratio in the leaf. Sprays of Tuzet or captan did not affect the chemical composition of the leaves. Tuzet sprays seemed to accelerate maturation of Jonathan fruits. [For parts I-III, see *H.A.*, 30: 5134.]—I.B.V.T., and R.T.C. voor PlZiektBestrijd., Wageningen.

512. Sitterly, W. R., and Shay, J. R.
Physiological factors affecting the onset of susceptibility of apple fruit to rotting by fungus pathogens.
Phytopathology, 1960, **50**: 91-3, bibl. 4.

See *H.A.*, 29: 312 e.

513. Salerno, M.
La "ticchiolatura" del nespolo del giappone (*Fusicladium eriobotryae* Cav.) in Sicilia. I. (**Loquat scab in Sicily. I. Its epidemiology and control with copper and non-copper fungicides.**) [English summary ⅓ p.]
Not. Mal. Piante, 1960, No. 52, pp. 79-90, bibl. 12, illus.

The following fungicides proved efficacious:—bordeaux, copper oxychloride, zineb, ziram, zineb + copper oxychloride, ziram + copper oxychloride, zineb + ziram, captan and TMTD. The timing of the sprays proved very important, and spraying is recommended 2-3 times from November to mid-January, once in February, and 2–3 times between 15 March and 15 May.—Univ. Catania.

514. Prota, U.
Osservazioni e ricerche sulla "ticchiolatura" del nespolo del giappone e prove di lotta eseguite in Sardegna dal 1957 al 1959. (**Observations and investigations on loquat scab and its control in Sardinia in 1957 to 1959.**) [English summary ⅓ p.]
Not. Mal. Piante, 1960, No. 52, pp. 45-64, bibl. 10, illus.

The tests showed that infection can occur right up to maturity of fruit in rainy weather with temperatures over 50° F. The amount of control necessary varied with seasonal conditions. Ziram (with or without copper or sulphur), zineb, copper oxychloride and Karathane, especially the last three, all proved valuable. Varietal differences in susceptibility were found to exist.—Univ. Sassari.

515. Hutton, K. E., and Kable, P. F.
Brown rot of stone fruits.
Agric. Gaz. N.S.W., 1960, **71**: 236-7, 247, illus.

See *H.A.*, 30: 431.

516. Ōmori, H.
On the control of peach anthracnose by fungicides.
Bull. Ehime Fruit Tree Exp. Stat., 1960, No. 1, pp. 77-92, bibl. 5, illus.

Blasticidin W, Blastmycin E, Antipiriculin E, Fumidin E, organic sulphur (Dithen W), organic mercury and PCP were sprayed on inoculated plants. Organic sulphur, organic mercury and the antibiotics were effective on young fruit, and Blastmycin E (200 p.p.m.) and Antipiriculin E (200 p.p.m.) were effective when sprayed on plants during the growing period. The injurious effects of organic mercury (0·001%) were overcome by using a Zn-lime solution (30 g. Zn sulphate + 50g. lime 10 litres). PCP used only as a dormant spray controlled anthracnose in its early stages.

517. ENGLISH, H.
Experiments on the control of *Phomopsis* canker in Kadoto fig trees.
Proc. 14th annu. Res. Conf. Calif. Fig Inst. 1960, pp. 13-15.

Experiments over 4 years showed that the mere application of fungicides does not provide adequate control at reasonable cost, though brush application of several organic mercury compounds to fresh pruning wounds has effectively reduced incidence of the canker. Pruning late in the dormant season also markedly reduced infection. In young orchards late pruning should be combined with the application of an effective mercuric wound disinfectant. Weak trees are more severely attacked than vigorous trees.

518. DEVAY, J. E., AND OTHERS.
Mallet wound canker of almond trees.
Calif. Agric., 1960, **14**(8): 8-9, illus.

Mallet blows during harvesting facilitate the entry of the fungi *Ceratocystis fimbriata* and *Cytospora rubescens*. Damage can be prevented by the proper use of mechanical shakers, and existing injury can be controlled by pruning out the diseased wood.—Univ. Calif., Davis.

519. KRSTIĆ, M., AND HOČEVAR, S.
Uticaj nekih antagonističkih mikroorganizama na infekcije pitomog kestena od *Endothia parasitica* Anders. (**The rôle of some micro-organisms in the prevention of *Endothia parasitica* infection of chestnuts.**) [English summary 1 p.]
Zasht. Bilja, 1959, No. 54, pp. 41-52, bibl. 4, illus.

Inoculation of *Castanea sativa* with cultures of *Penicillium rubrum*, *P. lilacinum*, *Verticillium* sp. and *Bacillus subtilis* reduced the incidence of natural infection by *Endothia parasitica* from 3·6% to 0·7%, *P. rubrum* being the most effective. Where the trees were inoculated with both the pathogen and the antagonist, no inhibiting effects were observed, probably owing to the more rapid development of pathogen.—Univ. Belgrade and Forest Res. Inst., Ljubljana.

520. CORKE, A. T. K.
Black currant leaf spot: treatment of overwintered leaves with fungicides: summary of experiments, 1953-59.
A. R. Long Ashton agric. hort. Res. Stat., 1959, 1960, pp. 118-22, bibl. 3.

During the winters of 1953-58 brief immersion in fungicidal materials, in the laboratory, of overwintering leaves infected with *Pseudopeziza ribis* effectively reduced the subsequent discharge of ascospores. Observations suggested that only some of the infected leaves carried the fungus through the winter on the ground. The value of an eradicant spray before leaf-fall is discussed. [Author's summary.]

521. SCHMIDLE, A.
Ein Zweigsterben der Johannisbeere, verursacht durch *Botrytis cinerea* Pers. ex Fr. II. Weitere Beobachtungen und Infektionsversuche an Roten und Schwarzen Johannisbeeren. (**Currant die-back caused by *Botrytis cinerea*. II. Further observations and infection studies on red and black currants.**)
NachrBl. dtsch. PflSchDienst., Braunschweig, 1960, **12**: 151-4, bibl. 5.

Earlier studies on the seasonal susceptibility of red currants to infection by *Botrytis cinerea* [see *H.A.*, 29: 268] were confirmed. Die-back of black currants only resulted from inoculation during November and December. The author suggests that *Botrytis cinerea* is not the chief causal agent of die-back in black currants.—Inst. Obstkrankh., Heidelberg.

522. KHAN, M. A. R.
A spraying trial against strawberry grey mould *(Botrytis cinerea)*.
A. R. Long Ashton agric. hort. Res. Stat., 1959, 1960, pp. 123-6, bibl. 8.

Griseofulvin 50% w.p. at 2½ lb./100 gal. and Karathane w.p. containing 25% dinitrocaprylphenyl crotonate at 12 oz./100 gal., sprayed on the strawberry variety Talisman, gave a significant degree of control of *Botrytis* rot in the field. The other fungicides in the test, Dodine and sorbic acid, were ineffective. No fungicide caused serious phytotoxic damage.

523. WINKS, B. L., AND OXENHAM, B. L.
Strawberry fruit rots can be controlled.
Qd agric. J., 1960, **86**: 311-13, illus.

Outstanding control of *Gloeosporium* ripe fruit rot and grey mould (*Botrytis cinerea*) was obtained by fortnightly spraying with captan, 2 lb. 50%/100 gal. Preventive measures include selection of a well-drained site, crop rotation, mulching, suitable spacing to avoid overcrowding, hygiene during picking and packing, and prompt marketing.

524. BRANAS, J.
La pourriture des raisins. (**Grey mould of grapes.**)
Progr. agric. vitic., 1960, **154**: 125-30, illus.

The prevalence of *Botrytis cinerea* in vineyards is attributed to its resistance to many fungicides (captan and TMTD are reasonably effective) and to the luxuriant fruit development resulting from modern viticultural practices. The varieties Pinot and particularly Piquepoul (Folle blanche) are highly susceptible if manured. Preventive meares recommended include the choice of varieties ith less compact bunches, growing on a tall main em, and pruning to give even distribution of liage.

525. Ribéreau-Gayon, G.
Les modalités de l'action de *Botrytis cinerea* sur la baie de raisin. **(The effects of *Botrytis cinerea* on vine berries.)**
Vitis, 1960, **2**: 113-16, bibl. 4.

iochemical changes in the berries following infection, and factors affecting the development of grey ould.

526. Skotland, C. B.
Sooty mold of grapes in the Yakima valley.
Proc. Wash. St. hort. Ass., 1959, p. 133, bibl. 5.

As this mould (principally a *Cladosporium* sp.) grows uperficially on the honeydew secreted by mealy ugs and other insects, control measures should im at the pests. Direct control measures failed.

527. Boubals, D., and Agulhon, R.
Récents progrès de la lutte contre l'excoriose par traitement d'hiver. **(Recent advances in the control of excoriosis of vines by winter treatment.)**
Progr. agric. vitic., 1960, **154**: 156-63, bibl. 5.

For control of excoriosis (*Phoma flaccida*) in the ery susceptible vine variety Aramon, the only products found effective for winter treatment were odium arsenite at 1·5% and, to a lesser degree, anthracene oil at 6% or DNC at 0·9–1%. The effective rates for the last 2 products were double hose usually recommended for vines. Sodium arsenite should be applied in dry weather, shortly before bud burst, but the other products, which are also active against scale insects, can be used at any ime during winter.—Inst. nat. Rech. agron., and Inst. tech. Vin. Paris.

Nematodes.

528. Decker, H.
Pratylenchus penetrans als Ursache von "Müdigkeitserscheinungen" in Baumschulen der DDR. **(*Pratylenchus penetrans* as the cause of soil sickness in nurseries in East Germany.)** [English summary 9 lines.]
Nematologica, Suppl. II, Rep. 5th int. Sympos. Plant Nemat., 1959, Uppsala, 1960, pp. 68-75, bibl. 10, illus.

In pear and apple nurseries soil sickness was found to be closely related to the incidence of *Pratylenchus penetrans* in the root zone at a depth of 16–24 cm. The nematode population was largest in summer and smallest in winter. In experiments with potted apple rootstocks successful inoculations of steam-sterilized soil produced the characteristic symptoms in the plants, whereas no stunting occurred where the inoculation failed and the nematodes did not multiply. The symptoms were not corrected by the application of borax or other nutrients. In the author's view it would be more correct to avoid the term soil sickness in future and to speak instead of nematode infestation.—Inst. Phytopath. PflSch., Univ. Rostock.

529. Meijneke, C. A. R.
Resultaten van twee grondontsmettingsproeven in aardbeien. Grondontsmetting of cultuurmaatregelen tegen wortelaaltjes in aardbeien. **(Results of two soil sterilization trials with strawberries. Soil fumigation or cultural measures for the control of root nematodes in strawberries.)** [English summary 1½ pp.]
Reprint from *Meded. LandbHogesch. Gent*, 1958, **23**: 636-45, illus.

In fields free from *Pratylenchus penetrans* populations of other nematodes were markedly reduced by DD fumigation (60 ml./sq.m.), strawberry growth was improved and the soil pH was slightly increased. It is considered that improved growth resulted from reduced nematode populations rather than from increased pH. It was best to remove the old plants with their roots and sterilize the soil before replanting. In plots where pieces of root were left in the soil after lifting old plants, nematode populations were relatively high in the following crop of summer-planted strawberries even after fumigation. —PlZiekt. Dienst, Wageningen.

530. Townshend, J. L., and Davidson, T. R.
Some weed hosts of *Pratylenchus penetrans* in Premier strawberry plantations.
Canad. J. Bot., 1960, **38**: 267-73, bibl. 16.

The present list of 55 weed hosts of this nematode brings the number of known plant hosts up to 232 species. Perennial weeds with soft-textured roots are the worst danger as reservoirs of the nematode, but winter annuals such as chickweed, which produce a continuous succession of plants, should also be strictly controlled.—Canada Dep. Agric., St. Catharines, Ont.

Mites.

(*See also* 131, 132, 142, 542-545.)

531. Harries, F. H.
Laboratory studies on orchard insects and mites, with emphasis on their development and control.
Proc. Wash. St. hort. Ass., 1959, p. 165.

Strains of the 2-spotted spider mite (*Tetranychus telarius*), collected from different districts, were equally susceptible to Kelthane, but strains of the McDaniel mite showed large differences in resistance to this acaricide. N deficiency was shown to inhibit egg-laying of the 2-spotted spider mite more than lack of P or K. Acti-dione was the most active of many chemicals tested in inhibiting egg-laying by this pest and offers a new approach to orchard control.—U.S.D.A., Wenatchee.

532. Larsen, D.
Birth control for mites?
West. Fruit Gr. 1960, **14**(5): 18.

Acti-dione and other antibiotics have been found to inhibit mite reproduction. Used on apples and peaches at 200 p.p.m. Acti-dione was systemic and remained effective for over 5 weeks. It was somewhat phytotoxic to pears.

533. Bognár, S., and Csehi, É.
A takácsatka probléma és jelentősége Magyarország almatermesztésében. **(The spider mite problem and its importance for apple production in Hungary.)** [English and Russian summaries 1 p. each.]
Kisérl. Közlem., Sect. C, 1959, **52C**(2): 75-101, bibl. 52, illus.

The literature is reviewed and supplemented by the authors' own observations with special reference to control. Of the spider mites occurring in Hungarian orchards the following 4 species were identified: *Bryobia praetiosa, Eotetranychus carpini, Tetranychus pilosus* and *T. telarius*. Their known host plants and more important predators are listed. In apple orchards 0·1% Metasystox, 0·2% Ekatox 20 and 0·5°B lime-sulphur have given the best control. Good results were also obtained with 0·5% Sool (*p*-chlorophenyl-*p*-chlorobenzene sulphonate), which was especially effective against summer eggs and active forms.

534. Hadžistević, D.
Šljivin crveni pauk (*Paratetranychus pilosus* C. et F.) i ogledi njegovog suzbijanja. **(The fruit tree spider mite, *Paratetranychus pilosus*.)** [German summary ¼ p.]
Zasht. Bilja, 1959, No. 55, pp. 81-6, bibl. 3.

Winter spraying with DNOC or summer spraying with malathion, diazinon, Fosferno, Carposan or Chlorocide, the last mixed with malathion, is recommended.

535. Parent, B.
Efficacité des prédateurs sur le tétranyque rouge du pommier, *Panonychus ulmi* (Koch), dans les vergers du Québec. **(Efficacy of the predators of the European red mite in the apple orchards of Quebec.)** [English summary 10 lines.]
Ann. Soc. ent. Québec, 1958, **4**: 62-9, bibl. 18.

Counts made in an experimental orchard in 1955, 1956 and 1957 revealed that in the absence of insecticides, save for one application of DDT on 12 June, 1956, predacious mites and insect predators contributed to the control of the European red mite. A mean reduction of 71% in seasonal populations and 72% in overwintering eggs was obtained. Important predators observed belonged to the Acarina, Thripidae, Coccinellidae, Pentatomidae, Miridae and Neuroptera. Predacious mites were the most effective group, with *Typhlodromus rhenanus* as the predominant species. [From author's summary.]—Minist. Agric., St. Jean, Québec.

536. Böhm, H.
Untersuchungen über Spinnmilbenfeinde in Österreich. **(Studies on the enemies of red spider mites in Austria.)** [English summary 11 lines.]
PflSch. Ber. Wien, 1960, **25**: 23-46, bibl. 20, illus.

The paper includes notes on the check to mite populations by various predators and on the susceptibility of the latter to sprays. The biology of the two main predacious mites, *Mediolata mali* and *Typhlodromus tiliae*, is discussed.

537. Łęski, R., and Szczygieł, A.
Doświadczenia nad zwalczaniem przędziorka owocowca (*Metatetranychus ulmi* Koch) w zimie i na wiosnę oraz nad wpływem stosowanych preparatów na dynamikę populacji. **(The effect of dormant and spring sprays on the red spider mite population on fruit trees.)** [English and Russian summaries ¾ p. each.]
Prace Inst. Sadown., Skierniewice, 1959, **4**: 278-89, bibl. 11.

No control of mite eggs on Common Prune was obtained by winter sprays of 6% lime-sulphur, 8% tar oil or both combined. The results obtained with 1·0 and 1·5% dinitro-o-cresol were inconsistent, when this was applied either as autumn or winter sprays, although it was more effective at the higher autumn temperatures. Even when DNC was effective in controlling the eggs, the subsequent build up of the red spider mite population was 6 times that on the unsprayed trees. A spring spray of 2% lime-sulphur, directly after the appearance of the larvae, was highly effective and no subsequent population increase was observed.

538. Lazić, M.
Eriophyes phloeocoptes Nalepa prouzrokovač gala na grančicama šljive. **(*Eriophyes phloeocoptes*, the cause of galls on plum branches.)** [French summary ½ p.]
Zasht. Bilja, 1959, No. 55, pp. 55-61, bibl. 16, illus.

The best control is obtained by systemic organophosphorus insecticides applied during bud burst, when the adult females are migrating from the old galls.

39. SMITH, B. D.
The behaviour of the black currant gall mite (*Phytoptus ribis* Nal.) during the free living phase of its life cycle.
A. R. Long Ashton agric. hort. Res. Stat., 1959, 1960, pp. 130-6, bibl. 5.
Effects of temperature and photoperiod on black currants and on the behaviour of the gall mite (*Phytoptus ribis* Nal.)
Ibidem, pp. 137-8, bibl. 3.

540. LEGOWSKI, T. J.
Control of the strawberry and cyclamen mite with Thiodan.
Plant Path., 1960, **9**: 114, bibl. 1, illus.

n a small-scale trial a spray of 1·2 pints of 0·05% hiodan plus a succinate wetter, applied at the end f May to strawberry plants, gave excellent control f *Steneotarsonemus pallidus* and increased the rowth of the plants.—N.A.A.S., Cambridge.

541. FOSCHI, S.
L'eriofide. **(The vine mite [*Phytoptus vitis*].)**
Ital. agric., 1960, **97**: 834-5, illus.

Treatment of vines is unsuccessful unless begun at he earliest signs of infestation. Spraying with 5% anthracene oil or with lime-sulphur at 7°Bè hortly before bud burst is recommended.

Insect pests.

(*See also* 139, 526, 527.)

542. HOYT, S. C.
Insect and mite control on apples during 1959.
Proc. Wash. St. hort. Ass., 1959, p. 159.

Codling moth, green apple aphid and McDaniel mite.

543. DELEGANS, V.
Apple and pear pest control in the Yakima Valley for 1959.
Proc. Wash. St. hort. Ass., 1959, pp. 163-4.

Pear psylla, codling moth, aphids and mites.

544. BURTS, E. C.
Insect control problems on pears in central Washington.
Proc. Wash. St. hort. Ass., 1959, pp. 161-2.

One season's results on control of pear psylla, European red mite, McDaniel mite and grape mealy bug (*Pseudococcus maritimus*) on pear.

545. ANTHON, E. W.
Recent research and control of stone fruit pests.
Proc. Wash. St. hort. Ass., 1959, pp. 34, 36.

Experiments over 3 years have shown that DDT (2 lb. 50% w.p.) plus parathion (1 lb. 25% w.p.) gives good control of peach twig borer. Other materials which have also given good control are dieldrin, oil plus DDT, Sevin, Guthion and diazinon. Green peach aphids have become resistant to standard organophosphorus insecticides, but the following materials gave good results: nicotine plus oil, Phosdrin, Thiodan, and nicotine plus soap [see also *H.A.*, 30: 5181]. Mites such as cherry rust mite or peach silver mite may be controlled with wettable sulphur, Kelthane or Sulphenone in 2 applications for large populations or 1 application for smaller infestations. Where rust mites, two-spotted or European red mites are present as well, Kelthane may be used to control all species. San José scale was best controlled by Volck Supreme oil used alone or in combination with various insecticides.—Tree Fruit Exp. Stat., Wenatchee, Wash.

546. ŁĘSKI, R., AND SMOLARZOWA, S.
Porównanie skuteczności preparatów kontaktowych i układowych w zwalczaniu mszyc na drzewach owocowych. **(Comparison between contact and systemic insecticides for fruit tree aphid control.)** [English and Russian summaries 1 and 1½ pp.]
Prace Inst. Sadown., Skierniewice, 1959, **4**: 259-77, bibl. 8, illus.

Nicotine, DDT, BHC, parathion, Ekatin and Pestox 3 were compared for their effectiveness in controlling *Aphis pomi*, *Hyalopterus pruni* and *Myzus cerasi* in both orchards and nurseries. All the compounds gave adequate control of apple and cherry aphis in nurseries, although curled apple leaves required double the dosage of contact insecticides as compared with systemics. In the orchards, however, DDT and nicotine were not satisfactory against apple aphids. In plum nurseries DDT was much less effective, and in plum orchards only parathion was comparable with the systemics. Pestox 3 was the most effective systemic, preventing reinfestation for 2 months; the effectiveness of Ekatin persisted only 7 days. Soil application of Pestox 3 was as effective as spraying.

547. MINISTRY OF AGRICULTURE, LONDON.
Apple aphids.
Adv. Leafl. Minist. Agric. Lond. **106**, revised 1960, pp. 8, illus.

Control of *Sappaphis mali*, *S. devecta*, *Aphis pomi* and *Rhopalosiphum insertum*.

548. DE JONG, D. J.
Bladluizen in 1960. **(Aphids in 1960.)**
Fruitteelt, 1960, **50**: 950-1.

The rosy apple aphis (*Dysaphis plantaginea*) and the allied species *D. devecta* can be controlled by spray or mist application of various insecticides to apple trees in the spring, before flowering. If, however, the treatment is delayed until the pests have rolled the leaves, a systemic product will be necessary. In one instance 0·5% Isolan at 500 l./ha. applied as mist gave good results at this stage. Overwintering eggs of *D. plantaginea* can be destroyed by winter spraying, but those of *D. devecta* are inaccessible under the bark scales, hence intensive control measures are necessary before oviposition begins in June. In general, *D. plantaginea* larvae and adults can be controlled by a single thorough mist application, as there is a migration in early summer to the seasonal host plants, *Plantago* spp.—I. P. O., Wageningen.

549. PINTO DA FONSECA, J.
Pulgão lanígero da macieira. **(The woolly aphid of apple trees.)**
Biológico, 1960, **26**: 114-15, illus.

Recommendations on prevention and control, including lime sulphur sprays in winter and mineral oil + 2% parathion emulsion in summer.

550. ŽIVANOVIĆ, V.
Neka zapažanja iz biologije i suzbijanja brašnjave lisne vaši na breskvi (*Hyalopterus amygdali* Blanch.) i šljivi (*Hyalopterus pruni* Koch.) **(Some observations on the biology and control of the mealy peach aphid (*Hyalopterus amygdali*) and the mealy plum aphid (*Hyalopterus pruni*.)** [English summary ¾ p.]
Zasht. Bilja, 1959, No. 55, pp. 23-36, bibl. 7, illus.

Both aphids, considered to be biotypes of the same species, were controlled by a winter spray of DNOC. As a summer spray Pestox 3 gave 100% kill, persisted for 48 days and was not lethal to predators, but it should not be used later than 6 weeks before full fruit maturity.

551. MINISTRY OF AGRICULTURE, LONDON.
Plum aphids.
Adv. Leafl. Minist. Agric. Lond. **34**, revised 1959, pp. 4, illus.

Control of *Brachycaudus helichrysi*, *Hyalopterus pruni* and *Phorodon humuli*.

552. SIENICKA, A.
Zmiany anatomiczne i cytologiczne wywołane przez *Myzus ribis* L. w liściach porzeczek (*Ribes*) i próby powiązania ich ze zbiorem owoców. **(Anatomical and cytological changes induced by *Myzus ribis* L. feeding on currant (*Ribes*) leaves and their effect on fruit yield.)** [Russian and English summaries 2 pp. each].
Zesz. Nauk. Szczecin, 1959, **2**: 91-117, bibl. 24, illus.

The galls produced by *Myzus ribis* on the leaves of 6 varieties of black and red currants are described and illustrated in detail. The reduction in fruit yield was found to be related to the number of leaves showing 3rd degree (very severe) deformation, in which guard-cells had disappeared and the assimilatory powers of the leaves were greatly reduced.

553. PRINC, JA. I.
More attention to planting European varieties on their own roots. [Russian.]
Vinodelie i Vinogradarstvo, 1960, **20**(4): 28-31.

Carbon disulphide, dichlorethane, para-dichlorbenzene, D-D and hexachlorbutadiene were shown to be effective soil fumigants against phylloxera. Several European varieties were tested in conjunction with an adequate fumigation programme and were found to be economically profitable when grown on their own roots.

554. SNAPP, O. I.
Plum curculio control experiments in 1955-58.
J. econ. Ent., 1960, **53**: 335-7, bibl. 2.

Cage tests showed the good residual value of Guthion and Sevin and the good short-lived effectiveness of Trithion against plum curculio (*Conotrachelus nenuphar*) on peaches. In field tests the recommended regular schedule of 5 applications of 2 lb. of 15% parathion w.p. per 100 gal. controlled light to moderate infestations. Most effective was a split schedule of 3 applications of 50% dieldrin at 1 lb. w.p., followed by 2 applications of 15% parathion at 2 lb. w.p. per 100 gal. Guthion was about as effective as parathion, and Sevin and Perthane were promising. Harvest residues of Guthion and Sevin were well below the approved tolerance on peaches, and those for Perthane were 1·3 to 2·1 p.p.m. [From author's abstract.]—Agric. Res. Serv., U.S.D.A.

555. SNAPP, O. I.
Soil treatments in lieu of spraying for plum curculio control in peach orchards.
J. econ. Ent., 1960, **53**: 439-41, bibl. 3.

In soil-box experiments aldrin and dieldrin prevented the emergence of adults of plum curculio (*Conotrachelus nenuphar*) for 8 seasons, heptachlor dust for 7 and heptachlor granules for 4 seasons. Chlordane granules were less effective than the above 3 compounds but better than isodrin, endrin, and Thiodan, irrespective of formulation. A soil treatment with 2·3 lb. per acre of aldrin as granules in an unsprayed peach orchard in March, 1957, resulted in only 1·6% infestation of harvested peaches in 1957, 2·9% in 1958 and 0·7% in 1959. In another orchard 2 lb. per acre of aldrin, applied to the soil as granules, prevented the development of adults from most of the larvae placed on the soil under the spread of sample trees over a 3-year period. Soil treatments with aldrin, dieldrin or heptachlor are now being used as a supplement to spraying in some peach orchards in Georgia.—Agric. Res. Serv., U.S.D.A.

556. FOSCHI, S.
Il sigaraio. ***(Byctiscus betulae.)***
Ital. agric., 1960, **97**: 758-9, illus.

This weevil can generally be controlled on vines by the treatments used against grape moths. If the attacks are severe, the most effective insecticides are phosphoric esters, which reach the larvae in the rolled leaves.

557. Orian, A. J. E., and Moutia, L. A.
Fruit flies (Trypetidae) of economic importance in Mauritius.
Rev. agric. sucr. Maurice, 1960, **39**: 142-50, bibl. 8, illus.

Fruit and vegetable hosts are listed for the indigenous species *Ceratitis catoiri*, and the 7 naturalized species:—*C. capitata*, *C. rosa*, *Dacus zonatus*, *D. cucurbitae*, *D. ciliatus*, *D. emmerezi* and *Pardalaspis cyanescens*. Control of *Ceratitis* spp. was obtained by early spraying with an insecticide, such as Perthane, Rhothane, DDT, malathion, sodium silicofluoride or Dipterex, combined with weekly baiting treatments using 10% sugar solution containing 0·6% active ingredient of Dipterex, 0·3% sodium silicofluoride or 0·5% malathion. The most successful control of *Dacus* spp. in cucurbits was achieved with bait sprays of 5% sugar solution containing either 0·15% lead arsenate, 0·02% a.i. DDT, 0·3% Gammexane or 0·1% a.i. aldrin. The baits were sprayed on maize grown for the purpose round the margins of the fields. The results of adding hydrolyzed yeast to the sugar baits were inconclusive, and diluted molasses (10%) was injurious to peach and loquat foliage. A useful auxiliary measure was soil treatment with aldrin or heptachlor when the flies began to emerge. Very promising control of the tomato fly (*Paradalaspis cyanescens*), a new pest in Mauritius, was achieved with weekly applications of Dipterex, alone at 0·5% a.i. and in 10% sugar baits at 0·6%. Parasites and predators of *Ceratitis* spp. are listed. Some have been introduced from Hawaii and Ceylon.

558. Milaire, H.
III. La mouche méditerranéenne des fruits, en 1959, dans la circonscription de Lyon et les nouvelles possibilités de lutte. **(III—The Mediterranean fruit fly in the Lyons district in 1959 and possible new methods of control.)**
Pomol. franç., 1960, **2**(7): 17-20, bibl. 2, illus.

Poison baiting with angelica seed oil as the attractant and a phosphoric ester insecticide gave promising results, permitting early trapping (during June). In 10 years of experiments this is the first year in which adult flies have been trapped before attacks on fruit have been observed. In some cases the numbers trapped were 3–4 times as great as with ammonium phosphate solution. Hitherto spraying has been directed against adult flies, but trials in 1959 have shown that dimethyl dithio-phosphorylacetic monomethylamide controls both adult flies and newly hatched larvae in the fruit. At 30 g. active ingredient per hl. it has a 10-day residual effect. In a trial on J. H. Hale peaches applications at 20 g. per hl. gave almost complete control compared with 60–90% infested fruit in the untreated plots. It is considered that 3-4 weekly applications, the last at the statutory 10 days before picking, would be a suitable schedule.

559. Nucifora, A.
Esperimenti di lotta contro la *Ceratitis capitata* Wied. eseguiti nel triennio 1956-58 con la N-monometilammide e la N-monoisopropilammide dell'acido O,O-dimetilditiofosforilacetico. **(Tests on the control of the Mediterranean fruit fly in 1956-58 with Rogor and other substances.)** [English summary ½ p.]
Ann. Sper. agrar., 1960, **14**(3), Suppl. pp. cxlvii-clxxii, bibl. 22, illus.

Field trials showed that Rogor gave complete control of the fly infestation in peach orchards in the years in question. Applied at 250 g./100 l. of the 20% commercial product it remained effective for about 20 days, whereas the same amount of parathion did not prevent heavy infestation. It was found best to apply Rogor twice, namely about 30 and about 20 days before harvesting.—Univ. Catania.

560. Tominić, A.
Voćna muha novi štetni član naše entomofaune. **(Fruit fly—a new, noxious member of our insect fauna.)** [English summary ¾ p.]
Zasht. Bilja, 1959, No. 55, pp. 3-14, bibl. 11.

Formulations of chlorinated hydrocarbons were rather slow in action against *Ceratitis capitata*, but phosphoric esters had a residual effect for 7-27 days.

561. Łęski, R., and others.
Doświadczenia polowe nad zwalczaniem nasiennicy trześniówki (*Rhagoletis cerasi* L.) przeprowadzone w 1957 r. w powiatach Grójec i Piaseczno w woj. warszawskim. **(Field studies on the control of cherry fruit fly in 1957 in the Grójec and Piaseczno counties south of Warsaw.)** [English and Russian summaries 1 p. each.]
Prace Inst. Sadown., Skierniewice, 1959, **4**: 246-58, bibl. 11.

All of the DDT formulations tested were more or less equal in effectiveness, and 0·1% actual DDT was an adequate concentration. The best results were obtained with a single spray at first cover 8 days after the emergence of the first flies.

562. California Fig Institute.
[Insect control.]
Proc. 14th annu. Res. Conf. Calif. Fig Inst., 1960, pp. 28-42.

In these pages are assembled short articles by various authors largely on problems of *Drosophila* control, chiefly as affecting figs but also with reference to grapes, peaches and tomatoes. A note is included on insect vectors of peach fruit rots.

563. Warner, R. M.
Bait cans control drosophila.
West. Fruit Gr, 1960, **14**(5): 19-20.

Bait, consisting of cull figs, yeast, water and a small amount of diazinon or malathion w.p., was very effective in controlling drosophila flies and the dried fruit beetle in fig orchards. Yields were increased in the baited orchards. Baiting throughout the year is recommended.—Calif. Fig Inst.

564. MADSEN, H. F., AND MCNELLY, L. B.
Control of the grape mealybug on apricots.
J. econ. Ent., 1960, **53**: 354-7, bibl. 6, illus.

Grape mealybug, *Pseudococcus maritimus*, damages apricot fruits by colonizing the stem end. The honeydew it produces discolours the fruit and cannot be removed. Experiments have shown that treatments timed to the spring emergence of crawlers were effective and preferable to autumn or winter sprays. Of the materials tested 25% parathion w.p. and 25% diazinon w.p., each at 1 lb. per 100 gal., gave the best control in a 2-year trial.—Univ. Calif., Berkeley.

565. RAMAN, K. R.
A new pest of importance on grapevine in Madurai district.
South Indian Hort., 1958, **6**: 64-6, bibl. 4.

The mealy bug *Ferrisiana virgata* (=*Pseudococcus virgatus*) was first observed on grapes in the Madurai district in 1956. Control has been obtained by spraying with Folidol E.605 after pruning, followed by sprays of fish oil rosin soap. The latter could be mixed with the bordeaux used for downy mildew control.

566. ALCHIN, J. D.
Pear leaf curling midge control.
Orchard. N.Z., 1960, **33**: 235-41, bibl. 5, illus.

Following preliminary trials on the control of *Dasyneura pyri* 5 insecticides were selected for a large-scale experiment. Sevin was the best of these and is recommended at present, but it is not considered good enough, and soil treatments are to be tested.—D.S.I.R., Auckland.

567. FISHER, R. W.
Note on resistance to DDT in the codling moth, *Carpocapsa pomonella* (L.), in Ontario.
Canad. J. Plant Sci., 1960, **40**: 580-2, illus.

In an orchard which had received annual sprayings of DDT since 1946, 86% of the fruit harvested in 1958 showed codling moth injury after 6 cover sprays. In 1959 seven cover sprays of 25% Guthion at 1¼ lb. per 100 gal. reduced the percentage of injured fruit to 7·5%, whereas with 5 sprays of 50% DDT at 2 lb. per 100 gal. the figure was 93·3%—Canada Dep. Agric., Vineland, Ontario.

568. RUSS, K.
Flugbeobachtungen an Faltern des Apfelwicklers (*Carpocapsa pomonella* L.) und Versuche zur Verbesserung der Obstmadenbekämpfung. (Vorläufige Mitteilung). (**Observations on the emergence of *Carpocapsa pomonella* and experiments on the improvement of codling moth control. (Preliminary communication).**) [English summary ⅔ p.]
PflSch. Ber. Wien, 1960, **25**: 67-90, bibl. 12, illus.

The emergence of codling moths in apple orchards was studied in Austria with the aid of an improved model of the Robinson light trap. No emergence occurred below 12° C. Low rainfall (0–5 mm. per day) did not affect the flight significantly, but a heavy precipitation inhibited or stopped emergence. Trees near the light trap were attacked less severely than trees further away. Eleven applications of DDT or parathion at weekly intervals did not improve the control of the pest beyond that achieved by 3 applications made on carefully chosen dates.

569. LLOYD, N. C.
The codling moth. Recent developments in its control.
Fruit World, Melbourne, 1960, **61**(2): 5-11, illus.

In New South Wales Gusathion and Sevin have effectively controlled the codling moth, including strains resistant to DDT, as well as the light brown apple moth [see next abstract and *H.A.*, 30: 3595]. Recommended rates are 1½–2 lb. Gusathion 25% w.p. and 1½–2 lb. Sevin 50% w.p. per 100 gal. Where DDT is satisfactory, its use should be continued and Trithion substituted in 1 application to control red spider. Likewise TDE should be substituted at the appropriate stages to control the light brown apple moth. Where spraying for codling moth has to be carried out close to harvesting, malathion is recommended for a late application because of the visible residues left by Gusathion and Sevin.—N.S.W. Dep. Agric.

570. LLOYD, N. C.
The light brown apple moth. A pest of deciduous fruits in New South Wales.
Fruit World, Melbourne, 1960, **61**(2): 15-17, illus.

With pome fruits, where DDT is still being used to control codling moth, it is recommended that TDE (DDD) at the rate of 2 lb. 50% w.p. or 2 pints of 20% emulsion concentrate per 100 gal. be included 2 or 3 times in the spray programme to control the light brown apple moth, *Tortrix postvittana*. Where Gusathion and Sevin are being used for codling moth control [see previous abstract], excellent control of the light brown apple moth will also be obtained. For stone fruits and grapes TDE should be used.—N.S.W. Dep. Agric.

571. PARADIS, R. O.
Répression de la tordeuse du pommier, *Archips argyrospilus* (Wlk.), dans le Sud-Ouest du Québec. (**Control of the apple leaf roller, *Archips argyrospilus* (Wlk.), in South-West Quebec.**)
Rep. Que. Soc. Prot. Plants, 1959, **41**: 76-82, bibl. 6.

The life cycle is described: complete control was obtained with DDT 50% at 2 lb./100 gal., Perthane at 3 pt. /100 gal. or Sevin 50% at 2 lb./100 gal.—Canada Dep. Agric., St-Jean, P.Q.

572. BAGGIOLINI, M.
Trois chenilles défeuillantes des arbres fruitiers actives en été: *Taeniocampa* (=*Monima*) *incerta*, *T. stabilis* (lép. noctuidés) et *Orgya gonostigma* (lép. lymantriidé.) **(Three leaf-eating lepidopterous caterpillars which attack fruit trees in summer: the noctuids *Taeniocampa* (=*Monima*) *incerta* and *T. stabilis*, and the lymantriid *Orgya gonostigma*.)**
Rev. romande Agric. Vitic., 1960, **16**: 78-81, illus.

In many cases the infestations (usually of apple and pear) are not sufficiently serious to necessitate control measures. Preliminary tests have led to the recommendation of DDD, DDT or lead arsenate against the spring generation and Dipterex against the summer generation of larvae.

573. MINISTRY OF AGRICULTURE, LONDON.
Lackey moth.
Adv. Leafl. Minist. Agric. Lond. **37**, revised 1960, pp. 3, illus.

Description of *Malacosoma neustria* and control with DDT.

574. MINISTRY OF AGRICULTURE, LONDON.
Vapourer moth.
Adv. Leafl. Minist. Agric. Lond. **25**, amended 1960, pp. 3, illus.

Description and life history of *Orgyia antiqua*, and control with derris or DDT.

575. BRUNSON, M. H.
Laboratory studies on the toxicity of various insecticides to different stages of the oriental fruit moth.
J. econ. Ent., 1960, **53**: 468-71, bibl. 2.

Methods are described for testing large numbers of insecticides against adults, eggs and newly hatched larvae of the oriental fruit moth (*Grapholitha molesta*). Of 54 compounds tested by these methods, Guthion, parathion, methyl parathion, Chlorthion, EPN and Sevin were the most effective. [From author's abstract.]—Agric. Res. Serv., U.S.D.A.

576. TURICA, A.
Adaptación en el país de un parásito natural del "gusano del duraznero". **(Adaptation in Argentina of a natural parasite of the oriental fruit moth.)**
Idia, 1960, **150**: 83-5.

The introduced parasite *Macrocentrus ancylivorus* has given satisfactory control of *Cydia molesta* on peaches.

577. BETHELL, D.
Report on pear psylla.
West. Fruit Gr, 1960, **14**(5): 24.

Guthion, $1\frac{1}{2}$ lb. 25% w.p./100 gal., gave good control, and dieldrin, 1·135 pt/100 gal., gave control superior to any of the organic phosphates.

578. NAGY, B.
A szilvadarazsak rajzása tekintettel a prognózis lehetőségeire. **(Possibilities of forecasting the date of the swarming of plum sawflies.)**
Növényvéd, idősz. Kérd., 1958, pp. 48-57, from *Hung. agric. Rev.*, 1960, **9**, Abstr. 42.

The start of the swarming of sawflies, chiefly *Hoplocampa minuta*, can be expected when, after 1 March, the average soil temperature (at a depth of 5 cm.) is above 10° C. for 11–12 days. Therefore in late springs swarming may start long before the blossoming of plum trees with the result that infestation is reduced. The examination of flowers for egg infestations is also valuable, since if only 2–3% of the flowers are infested control measures are unnecessary. Observations on the hatching of the eggs may serve as a basis for the timing of spray applications. [For control of plum sawfly see *H.A.*, 30: 505].

Other pests.

579. GLAS, A.
Een oude methode in een nieuw jasje. **(An old method in new clothes.)**
Fruitteelt, 1960, **50**: 1219, illus.

An effective method of scaring birds in orchards was to suspend tin cans containing glass marbles above the trees, and to jerk the string at intervals by an impulse driven by an electric motor.—R.T.C., Amstelveen.

580. MINISTRY OF AGRICULTURE, LONDON.
The bullfinch.
Adv. Leafl. Minist. Agric. Lond. **234**, revised 1960, pp. 8, illus.

Its feeding habits, and control by shooting and trapping.

581. GRULICH, I.
Škody způsobené hrabošem polním na ovocných dřevinách. **(The field mouse as a fruit tree pest.)** [Russian and German summaries $\frac{1}{4}$ p. each.]
Rostlinná Výroba, 1960, **6**: 253-60, bibl. 10, illus.

Microtus arvalis attacks fruit trees up to the age of 20–25 years, showing a preference for apples, apricots and peaches. In control experiments baits of oats treated with zinc phosphide (7–10% by weight) and sprays of endrin emulsion at 500 c.c. in 400–600 l. water per ha. have given the best results.

Chemicals and their application.

(*See also* 127, 128, 134, 140-143, 195, 442, 498, 557.)

582. McMechan, A. D., and Williams, K.
Note on the effect of pump pressure on the performance of concentrate orchard sprayers.
Canad. J. Plant Sci., 1960, **40**: 583-5, bibl. 5.

Using a single-sided sprayer delivering 7,000 cu. ft./min. at 115 m.p.h., the deposition of DDT on leaves of apple trees was similar at pressures of 75 p.s.i. and 300 p.s.i. With a double-sided sprayer delivering 10,300 cu. ft. at 87 m.p.h., deposits on the lower leaves were lower at 75 p.s.i. than at 300 p.s.i., whereas on the higher leaves the effect of pressure was inconsistent. Control of codling moth in apple was adequate with both sprayers at either pressure.—Dep. Agric., Summerland, B.C.

583. Gjaerum, H. B.
Kjemikalieskade på eplefrukt etter seinsprøyting. (**Chemical injury to apple fruits after late spraying.**)
Frukt og Baer, 1960, **13**: 31-6, bibl. 4, illus.

Scald-like spots were observed on Gravenstein fruits following a captan spray just before picking. Further studies showed that damage to many varieties was marked following Dodine (Cyprex) and especially captan sprays applied late in the summer. Sulphur, maneb and zineb did not appear to be harmful.—Stat. Plantevern, Vollebekk.

584. Durham, W. F., and Wolfe, H. R.
Studies on some potential health hazards associated with insecticide residues on pome fruits.
Proc. Wash. St. hort. Ass., 1959, pp. 127-31, bibl. 14.

Additive effects of combined DDT, dieldrin and toxaphene residues.

VEGETABLES. TEMPERATE, TROPICAL AND GLASSHOUSE.

General.

(*See also* 112, 167, 279, 1631, 1641, 1658.)

585. Wellesbourne.
Tenth Annual Report of the National Vegetable Research Station, Wellesbourne, 1959, 1960, pp. 63, bibls, illus.

Plant breeding: Work on improving varieties and strains of brussels sprouts, red beet, spring cabbage and winter cabbage is reported; blow flies were used for cross pollinating brussels sprouts; early summer varieties of cauliflower were generally self-compatible, whereas autumn and winter varieties were self-incompatible in varying degree. *Chemistry*: The responses of red beet, spring cabbage and runner beans to N, P and K, with and without F.Y.M., were investigated; one effect of lowered temperatures on the metabolism of red beet roots is the replacement of anaerobic respiration by an aerobic process. *Plant physiology:* Competition studies with various crops and growth studies on carrots were continued. *Irrigation:* Maximum yield of summer cauliflowers was shown to depend on a plentiful supply of water; irrigating peas between sowing and flowering increased the weight of haulms but not the yield of peas, but irrigation when the pods were swelling increased the crop; spraying runner bean flowers failed to affect pod set. *Entomology:* Dieldrin incorporated in the soil was a highly effective means of controlling the carrot root fly; diazinon incorporated in the soil controlled the lettuce root aphid. *Plant pathology:* Zinc frit at $\frac{1}{2}$ lb. per sq. yd. successfully controlled crook root disease of watercress; sowing parsnips in June instead of March reduced losses from canker; soil treatment with zinc sulphate has given good control of mildew on turnips, swedes and cabbages, but not on cucumbers, vegetable marrows, chrysanthemums and gooseberries despite the accumulation of Zn in their leaves. *Weed investigations:* Numbers of weeds increased with increasing fineness of soil tilth; pre-emergence weedkillers have been found successful with broad beans, peas and autumn sown onions.

586. Committee on Vegetable Breeding and Varieties.
New vegetable varieties. List VI.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 842-50.

Brief notes on varieties introduced into the U.S. since 1936.

587. National Institute of Agricultural Botany, Cambridge.
Guide to varieties of field and vegetable crops under trial, observation and propagation 1960.
[*Publ.*] *nat. Inst. agric. Bot.*, 1960, pp. 79.

588. Wallen, V. R., Chamberlain, G. C., and Cinq-Mars, L.
The value of seed protection for vegetable crops in eastern Canada.
Canad. Plant Dis. Survey, 1960, **40**(1): 18-23, bibl. 1.

The results of vegetable seed treatment trials with fungicides and fungicide-insecticide combinations for the improvement of emergence and the prevention of damping-off in pea, bean, corn, cucumber and squash seed are summarized. The trials were held at St. Catharines and Ottawa, Ontario, and St. Jean, Quebec, during the summers of 1957, 1958 and 1959. The significant increases in emergence resulting from treatments containing thiram, captan and dichlone are proof that vegetable seed treatment is essential in these areas. [Authors' abstract.]

589. KAMRA, S. K.
The effect of treatment with absolute alcohol on seeds of different species.
Indian J. Plant Physiol., 1959, **2**: 132-40, bibl. 11.

The resistance of lentil, rye, rape, onion, lettuce and pea seeds to absolute alcohol was tested, germination and water content being observed over a period of 50–150 days. Rye and lentil seeds showed the least resistance and pea seeds the most. Seeds which normally remained viable for relatively long periods showed the greatest resistance.

590. SPENDER, B.
Die Temperaturbehandlung des Saatgutes wärmeliebender Fruchtgemüsearten und ihre Nachwirkung auf die Ausbildung generativer Merkmale, insbesondere auf den Ertrag. **(Temperature treatment of the seeds of heat-loving fruiting vegetables, and its effect on the development of reproductive features, and particularly on yield.)** [Russian and English summaries ⅓ p. each.]
Arch. Gartenb., 1960, **8**: 368-82, bibl. 61.

Experiments over 3 years on the cold treatment of cucumber seeds showed a significant yield increase and earlier maturity in only 20% of the results, and positive results in tomatoes were almost nil. Previous experiments with high-temperature treatment of cucumber seeds were about as successful as those involving low temperatures, neither being worth considering for practical application.—Inst. Gartenb., Grossbeeren, Berlin.

591. BIELKA, R.
Ein Beitrag zur Jarowisation thermophiler Gemüsearten. **(A contribution to the vernalization of heat-loving vegetables.)** [Russian and English summaries ⅓ p. each.]
Arch. Gartenb., 1960, **8**: 383-98, bibl. 15.

Field trials were carried out during 2 consecutive years with beans, cucumbers and tomatoes. The seeds were either unsoaked or allowed to imbibe water to 30, 50, 70 or 100% of saturation, and were exposed for periods ranging from 2 hours to 10 days to temperatures of 25–60° C. Compared with untreated controls, all the treated seeds showed increased germination energy, but the results did not indicate that the treatments would be worth applying in practice.—Karl-Marx-Univ., Leipzig.

592. KRUŽILIN, A. S., AND ŠVEDSKAJA, Z. M.
The role of leaves in the vernalization of winter [cereals] and biennial plants. [Russian, with English summary ⅓ p.]
Fiziol. Rast., 1960, **7**: 287-95, bibl. 14, illus.

In biennial plants vernalization occurs in seedlings only when a minimum of 20–30 sq. cm. of green leaf area is present, or in mature (seed) plants when the storage organs (roots in carrots and beets and bulbs in onions) have developed. When storage organs but no leaves are present, bud differentiation and flower shoot formation occur in some plants (cabbage and onion) but not in others (root crops). When seedlings of biennials are grafted onto annuals or onto mature plants of their own species vernalization is controlled by the rootstock, except in the case of cabbage. To obtain a response with cabbages seedlings grafted onto an annual should have their leaves removed, or when they are grafted onto mature cabbages the seedlings should first be vernalized. [See also *H.A.*, 29: 2519.]

593. KRUŽILIN, A. S., AND ŠVEDSKAJA, Z. M.
Differentiation of the growing points in biennial root crops. [Russian, with English summary ¼ p.]
Fiziol. Rast., 1960, **7**: 435-8, bibl. 8, illus.

In carrots, celeriac and beetroot the transformation of vegetative into generative buds occurred at high temperatures after vernalization during the light phase of development and in the presence of leaves. During the light phase 4 stages of morphogenesis were distinguished in both seedlings and 1-year-old seed plants, though the individual stages were shorter in the latter.

594. REINHOLD, J., AND OTHERS.
Ergebnisse mit der Umluftheizung im Gemüsebau. **(Results obtained with forced-circulation heating as applied to vegetables.)** [Russian and English summaries 12 and 9 lines.]
Arch. Gartenb., 1960, **8**: 249-66, bibl. 5, illus.

A system of forced circulation of hot air for glasshouse heating has been developed and used successfully for vegetable crops (chiefly tomatoes and cucumbers) [see also *H.A.*, 30: 3213]. Air temperature measurements showed that heat distribution was similar with this system to that with conventional hot-water heating, and no differences in crop yields or earliness were observed. The air is drawn from the south end of the house into channels beneath the paths, and is reheated by passing it over a steam-heated radiator before being blown back into the house at the north end. Soil heating and sprinkling are necessary with this system of heating.—Inst. Gartenb., Grossbeeren.

595. SEIDEL, E.
Untersuchungen über die Strahlungsbedingungen bei der Zusatzbelichtung von Gemüsepflanzen in Gewächshäusern. **(Studies on the conditions of irradiation associated with the supplementary lighting of vegetable plants in glasshouses.)** [Russian and English summaries 12 and 10 lines.]
Arch. Gartenb., 1960, **8**: 267-96, bibl. 35, illus.

Natural light and artificial light (low-voltage neon lamps) produced similar physiological responses in vegetables when the radiation energy of both sources was the same. Examination of the radiation conditions under different sources of artificial light showed that the most favourable conditions were created by assembling a number of low-pressure fluorescent lamps to form aggregate units. In this way high light intensity was combined with uniform distribution.—Inst. Gemüseb., Grossbeeren.

596. Seidel, E.
Untersuchungen über die Anwendingsmöglichkeit von Wanderlichtanlagen im Gemüsebau unter Glas. (**Studies on the suitability of mobile lighting for vegetable growing under glass.**) [Russian and English summaries 10 and 7 lines.]
Arch. Gartenb., 1960, **8**: 297-310, bibl. 5, illus.

Lamp aggregates which travel to and fro over young cucumber plants could not produce the right physiological conditions for growth and are not recommended for commercial adoption. In comparison with stationary lighting, the large surface area to be lighted and the variations in light intensity were disadvantageous.—Inst. Gemüseb., Grossbeeren.

597. Podešva, J.
Výsledky pokusů s umělým přisvětlováním rychlených zelenin. (**Results of trials with artificial illumination for forcing vegetables.**) [Russian and German summaries 9 lines each.]
Acta Univ. Agric., Brno, Ser. A, 1959, Special No., pp. 109-16, bibl. 8, illus.

Illumination of seedlings of early vegetables with fluorescent tubes at 1,200–1,800 lux per sq. m. from 3 to 12 p.m. daily from December 20 to January 25 showed practical advantages and was economical. Lettuces were harvested 15–19 days, glasshouse cucumbers 11–16 days, and kohl-rabi and peppers 8–12 days earlier than the controls. The treated plants also produced higher yields.

598. Chhonkar, V. S.
Starter solutions—the answer to transplanting troubles.
Indian Hort., 1959, **4**(1): 7-9, illus.

The composition is given of 5 starter solutions containing N, P and K in different proportions and Ca in 2 cases. Methods of applying them to transplants of the commoner Indian vegetables are outlined.—Bihar agric. Coll., Bhagalpur.

599. Flores Reyes, I.
Pruebas de adaptación de algunos cultivos hortícolas para tierras bajas del estado de Nuevo León. (**Adaptation trials with some vegetable crops on the poor soils of the Nuevo León State [Mexico].**)
Proc. Carib. Reg. Amer. Soc. hort. Sci., 1957, 1958, **5**: 50-1.

Observations on the best varieties and date of sowing of some 20 vegetable crops on an alkaline soil low in organic matter.

600. Yu, C. -H., and Wu, Y. -L.
Preliminary report on the growth of potted vegetables in Lishan farm's soil. [Chinese, with English summary ½ p.]
J. agric. Ass. China, 1960, **29**: 59-64, bibl. 17, illus.

Chinese cabbages, cucumbers and asparagus beans grew poorly owing to the low soil pH (3·8–4·1) and low fertility, but the cabbages grew well when 0·16% lime and 5% compost, alone or in combination, were added to the soil.

601. Grebinskij, S. O., and Popovič, I. V.
The relationship between the yield of onion tops, lettuce and cabbage and the nitrogen, phosphorus and potassium content of their leaves. [Russian.]
Fiziol. Rast., 1960, **7**: 82-6, bibl. 10.

Improved yields were associated with an increased N : P ratio in the leaves. It is suggested that high yields can be obtained when the total N content of the leaves is at least 3% of dry weight in onions, 4% in lettuce and 5% in cabbage.—Lvov St. Univ.

602. Scharrer, K., and Mengel, K.
Aufnahme und Verteilung der Kationen Ca, Mg, K und Na in der Pflanze bei variierter K- und Mg-Düngung sowie bei extraradikaler K-Versorgung. (**The absorption and distribution of Ca, Mg, K and Na cations in the plant as affected by various rates of K and Mg application and by foliar K applications.**)
Plant and Soil, 1960, **12**: 377-96, bibl. 26.

The effects of various root and foliar applications of K and Mg on the Ca, Mg, K and Na contents of roots, stems and leaves were studied in tomatoes, tobacco, beans (*Vicia*), peas and cucumbers, using water culture methods. The ion competition of K with Mg and Ca was best seen in the leaves, but was also found in the stems and roots. Competition between K and Na was most evident in the roots. A supplementary foliar application of K reduced the Ca, Mg and Na contents of the leaves, but did not affect the stems and roots. The effects of increased root applications of Mg on the Ca, K and Na contents was not clear.—AgrikChem. Inst. Justus-Liebig-Univ., Giessen.

603. Oebker, N. F., and Courter, J. W.
Growers try paper mulch.
Amer. Veg. Gr, 1960, **8**(5): 18-19, illus.

A fungicide-treated, black paper mulch offers many of the benefits of plastic, is much cheaper and creates no disposal problem as it can be ploughed in [see also *H.A.*, 29: 3703]. A 40-in. wide paper costs $100 per acre compared with $120-140 for plastic. A modified tractor-attached plastic mulch applicator has been used for laying. For tomatoes and cucumbers 6 ft. between the rows proved a suitable spacing when using paper mulch. Temperatures under a brown paper mulch were about the same as in cultivated soils. Yields of tomatoes and cucumbers were significantly increased when the mulch was used.—Univ. Ill.

604. King, E. M., and others.
[Weed control in] horticultural crops. (a) Vegetables and sugar beets.
Res. Rep. west. Sect. nat. Weed Cttee Canada, 1959, pp. 99-104.

Weed control trials in asparagus, beetroot, cabbage, cauliflower, snap beans, tomatoes and other crops are summarized.—See *Weed Abstr.*, **9**, No. 943.

605. National Weed Committee, Eastern Section.
[Weed control in] horticultural crops. (a) Vegetables.
Res. Rep. east. Sect. nat. Weed Cttee Canada, 1959, pp. 63-82.

The reactions of many crops and weeds to numerous herbicides.—See *Weed Abstr.*, **9**, No. 942.

606. National Weed Committee, Eastern Section.
Basic studies [in weed control].
Res. Rep. east. Sect. nat. Weed Cttee Canada, 1959, pp. 140-6.

Six reports are summarized. Simazine and atrazine at 1 or 2 lb./acre did not injure turnips or kidney beans sown 8 weeks later, but May plantings of both crops were severely injured on plots that had been treated the previous summer with 4 lb./acre of simazine, atrazine or ipazine.—From *Weed Abstr.*, **9**, No. 1042.

607. Fang, S. C., and Theisen, P.
Uptake of radioactive ethyl-*N*, *N*-di-*n*-propylthiolcarbamate (EPTC-S^{35}) and translocation of sulfur-35 in various crops.
J. agric. Food Chem., 1960, **8**: 295-8, bibl. 2, illus.

Studies of distribution were made in various vegetables. All contained more S^{35} in the tops than the roots, and in radishes, carrots, cabbages and cucumbers the tops contained over 80% of the total amount absorbed. Uptake increased with increased application but not proportionally. [See also *H.A.*, 30: 2072.]

608. Granett, P., and Reed, J. P.
Field evaluation of Sevin as an insecticide for pests of vegetables in New Jersey.
J. econ. Ent., 1960, **53**: 388-95, bibl. 11.

In trials conducted since 1954 wettable powder formulations of Sevin applied at rates of 0·25 to 1 lb. active ingredient per 100 gal. have given good control of cabbage flea beetle (*Phyllotreta cruciferae*) on cabbage, broccoli and turnip and of potato leafhopper (*Empoasca fabae*) and Mexican bean beetle (*Epilachna varivestis*) on snap beans. Sevin was less effective against some other vegetable pests and completely ineffective against the two-spotted mite (*Tetranychus bimaculatus*) on beans. The compound did not appear to have any marked effect on either yield or flavour. Initial spray residues decreased progressively, becoming relatively low at the end of a week.—N.J. agric. Exp. Stat., Rutgers.

609. Kuitert, L. C.
A promising new insecticide for controlling vegetable insects.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 211-13, bibl. 1.

Sevin applied either as a dust or spray has given good control of the Mexican bean beetle, and has also given fair control of the imported cabbage worm (*Pieris papae*) on cabbages, with no evidence of phytotoxicity.

610. Genung, W. G.
Ecological and cultural factors affecting chemical control of subterranean cutworms in the Everglades.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 163-7, bibl. 6, illus.

Obtaining early chemical control of the cutworms *Agrotis ypsilon* and *A. subterranea* in vegetable crops and maintaining this control by removing the preferred host, the weed *Amaranthus spinosus*, has given good results.—Everglades Exp. Stat., Belle Glade, Fla.

611. Jenser, G.
Adatok a kertgazdasági növényeinket károsító tripszek ismeretéhez. (**A contribution to the knowledge of thrips damaging horticultural plants in Hungary.**) [Russian and German summaries 2 pp. each.]
Kert. szől. Főisk. Évk., 1958 (issued 1959), **22**(6, part 6): 3-35, bibl. 30, illus.

Descriptions are given of species of thrips and the injury they cause on vegetables, flowers and tobacco. In control experiments insecticides containing BHC, DDT or parathion have given good results.

612. Holmes, E. S.
Mechanical aids and equipment for harvesting vegetables in Florida.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 197-9, bibl. 2, illus.

Several mechanical harvesters are described briefly and current investigations are outlined [see also *H.A.*, 30: 3725].

613. Halsey, L. H.
Mechanization and quality in harvesting Florida vegetables.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 153-5, bibl. 3, illus.

Techniques and machinery have been developed for harvesting radishes, celery, lettuces, cabbages, cauliflowers, cucumbers, peppers and some other vegetables. There may be some economic justification for the amount of damage being greater from mechanical harvesting than from hand harvesting, provided the reduction in harvesting labour outweighs the effort required to remove damaged vegetables during packing.—Fla agric. Exp. Stat., Gainesville.

614. Kopec, K.
Možnosti využití retardačních látek při uchování zeleniny. (**Possibilities of using growth inhibiting substances in vegetable storage.**) [Russian and German summaries ¼ p. each.]
Acta Univ. Agric., Brno, Ser. A, 1959, Special No., pp. 139-42, bibl. 7.

Preliminary results are given of investigations on the effects of maleic hydrazide and the methyl ester of NAA on onions, carrots, parsnips, celeriac and tomatoes. Losses in weight were reduced, especially in onions. Certain chemical changes occurred, notably an alteration in the proportions of different sugars, reduced respiration and a reduction in the activity of redox enzymes, which indicated that the treatment of vegetables might reduce resistance to microbial infection.

615. Shipton, J.
Characteristics required of vegetables for processing.
Food Pres. Quart., 1960, **20**: 13-16.

Specific quality requirements sought in tomatoes, green peas, green beans, dry (navy) beans, onions, cauliflowers and potatoes are listed.—C.S.I.R.O., Homebush, N.S.W.

Artichokes.

616. Fatta del Bosco, G.
Il carciofo spinoso di Palermo. (**The spiny globe artichoke of Palermo.**)
Ital. agric., 1960, **97**: 716-37, bibl. 7, illus.

Soil requirements, tillage, rotation, manuring, pest and disease control, production and marketing.

617. Marras, F.
Esperienze di lotta contro il "mal bianco" del carciofo. (**Tests on the control of *Leveillula taurica* on globe artichoke.**)
Not. Mal. Piante, 1960, No. 52, pp. 23-44, bibl. 8, illus.

Of various substances tried, viz. sulphur in various forms, thiram, Acerbin, Shirlan and Karathane, only the last at 0·06 and 0·09% proved satisfactory in tests in Sardinia. Treatment should start directly the affected shoots appear.—Ist. Pat. veg., Univ. Sassari.

Asparagus.

618. Ellison, J. H., Scheer, D. F., and Wagner, J. J.
Asparagus yield as related to plant vigor, earliness and sex.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 411-15, bibl. 12.

Yield of individual asparagus plants is correlated positively with early yield, number of stalks and stalk diameter. Mean spear diameter is correlated positively with early spear diameter and with stalk diameter, and is correlated negatively with number of stalks per plant. Because yield is correlated with earliness and brush vigour, the latter characters may be used efficiently as selection criteria in place of yield. [From authors' summary. For earlier work, see *H.A.*, 29: 2439 and 3571.]—Rutgers St. Univ., New Brunswick, N.J.

619. Scheer, D. F.
Seedling selection of high yielding asparagus plants.
Diss. Abstr., 1960, **20**: 4236, being *L. C. Card No. Mic.* 60-1451 of 45 pp.

Asparagus seedlings growing in a glasshouse were classified into low, medium and high vigour individuals on the basis of stalk number multiplied by diameter of the largest stalk per plant 2½ months after sowing. The seedlings were then transplanted to the field. A positive correlation was found between the first year yield and seedling stalk number in females but not in males. [See also *H.A.*, 29: 3571.]—Rutgers St. Univ., New Brunswick, N.J.

620. Scheer, D. F., Ellison, J. H., and Johnson, M. W.
Effect of fruit maturity on asparagus seed germination.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 407-10, bibl. 7.

Low germination is a common problem with asparagus seed. Experiments were conducted to study the effects of seed grading, early versus late fruit crop, and fruit maturity on seed germination. It was found that machine grading was effective in removing light, immature seeds of low germination percentage, when there was a large proportion of this type of seed in the sample. Germination was poor in seed harvested from late brush. Seed from red ripe berries was superior in germination to that from less mature bronze-coloured fruit. [Authors' summary.]—Rutgers St. Univ., New Brunswick, N.J.

621. Thuesen, A.
Cytogenetical studies in *Asparagus officinalis* L.
Yearb. roy. vet. agric. Coll., Copenhagen, 1960, 1960, pp. 47-71, bibl. 16.

Including studies on the production of polyploid asparagus with colchicine.

622. Johnson, W. B.
How to grow better spears.
Amer. Veg. Gr, 1960, **8**(6): 9, 31, illus.

Notes on increased asparagus yields from closer spacing and on the replant problem in New Jersey.

623. Moran, C. H., and Isaacs, R. L., Jr.
Effect of crown spacing on the yield of asparagus.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 416-18, bibl. 5.

An asparagus spacing study was conducted on a Freehold fine sand for 9 years during which there were 7 full harvests. Rows were spaced 5 ft. apart with spacing between plants of 6, 12, 18 and 24 inches. The 6-inch spacing plots were superior to the 12-, 18- and 24-inch plots in number of spears and total weight of asparagus produced per acre. As plant spacing increased the number of asparagus spears per plant increased. The greater number of spears per plant did not compensate for the smaller number of plants per acre. The 18- and 24-inch plant spacings produced 7-year mean spear weights of 26·7 and 26·4 g., which were significantly greater than the 25·4 g. means for the 6- and 12-inch spacings. [Authors' summary.]—Campbell Soup Co., Riverton, N.J.

624. Blumenfield, D.
Forecasting the time of asparagus harvest.
Diss. Abstr., 1960, **20**: 4232-3, being *L.C. Card No. Mic.* 60-1423 of 108 pp.

Over a 15-year period various base temperatures were compared for use in forecasting the first cut of asparagus by the method of summing degree days. In most years a base temperature of 16° F. gave a more accurate forecast of the first cut than base temperatures of 12°, 24°, 30,° 33°, 40° or 48° F., but using a combination of 16° and 48° F. gave an even more reliable forecast. The asparagus crown normally passes into a quiescent stage during cold weather. In 1957 and 1958 minimum activity of the crowns occurred in January, but cold storage at 31° or 34° F. for various periods failed to induce this quiescent stage. Growth rate studies of spears showed that this was proportional to temperatures and spear height, an increase of 0·35 cm. in the daily growth rate being associated with an increase of 1 cm. in spear height, and a 0·31 cm. increase in the daily growth rate with an increase in temperature of 1° F. The relationship between growth rate and temperature was almost linear within a mean temperature range of 45° to 75° F.—Rutgers Univ.

Brassicas.

(*See also* 10, 18, 111, 120, 128, 600, 601, 1656, 1665.)

625. Smith, I. D. W.
Cabbage, cauliflower, broccoli and brussels sprouts.
Publ. Ont. Dep. Agric. **117**, revised 1960, pp. 10.

Varieties, cultural practices, harvesting and storage.

626. Kiss, F.
Adatok a káposztafélék virágzásbiológiai vizsgálataihoz. (**Contributions to the study of the flower biology of brassicas.**) [Russian and German summaries ⅔ p. each.]
Kísérl. Közlem., Sect. C, 1959, **52C**(2): 29-37, bibl. 7, illus.

Data on the anatomy of cabbage, cauliflower and kohl-rabi flowers in relation to pollination.

627. Wellensiek, S. J.
Annual brussels sprouts. [Dutch summary 7 lines.]
Euphytica, 1960, **9**: 10-12, bibl. 3.

Investigation of an annual plant indicated that annual flowering was dominant and monogenic.

628. Nieuwhof, M., and Kraai, A.
Praktijkproeven met rode kool 1956-1958. (**Commercial trials with red cabbage 1956-1958.**) [English summary 8 lines.]
Meded. Dir. Tuinb., 1960, **23**: 453-8, illus.

Cropping and storage qualities of 22 strains of red cabbage varieties evaluated.

629. Kelbert, D. G. A.
Head formation of cabbage as affected by exposure to low temperature.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 177-9, bibl. 4, illus.

In a trial of 21 varieties and strains two severe frosts caused no malformation of heads in Earliana, Greenback, Midseason Market, Badger Ball Head Y.R. and one strain of Copenhagen Market, whereas in Round Head and Marion Market malformation exceeded 10%.—Gulf Coast Exp. Stat., Bradenton.

630. Nieuwhof, M.
Internal tipburn in white cabbage. I. Variety trials.
Euphytica, 1960, **9**: 203-8, bibl. 11, illus.

Among Dutch autumn varieties Succes and Glory of Enkhuizen were only slightly susceptible, whereas Langedijker Autumn White was highly susceptible. Between the strains of the latter variety there were clear differences in this respect. The phenomenon of tipburn may be associated with the water regime of the plant. However, there was no correlation between the amount of wrapper leaves (as a measure of the size of the transpiration surface) and the degree of tipburn. The observed differences in the amounts of tipburn were correlated with different growth rates. Presumably, when growth is rapid the resulting weak tissue may enhance susceptibility. [From author's abstract. See also *H.A.*, 30: 5382.]—Inst. hort. Plant Breed., Wageningen.

631. Finch, C. G.
Classification and description of vegetable varieties and a summary of the results of such in early summer cauliflowers.
Progr. Rep. exp. Husb. Fms and exp. Hort. Stats 1960, pp. 13-17, bibl. 8, illus.

The system of "continuous" testing of vegetables, as used by the N.I.A.B. in co-operation with the Experimental Horticulture Stations, is described with particular reference to early summer cauliflowers.—N.I.A.B., Cambridge.

632. Smith, F. G., and Sandwell, I.
Earlier planting reduces small curd tendency.
Grower, 1960, **54**: 667-8.

In Yorkshire planting out early summer cauliflowers at the beginning of March results in earlier maturity without producing a high proportion of small curds. Varieties and the cultural methods recommended are described.—Stockbridge House Exp. Hort. Stat.

633. Martin, M. E., and others.
Factors affecting the ascorbic acid and carotene content of broccoli.
J. agric. Food Chem., 1960, **8**: 387-90, bibl. 16.

Mainly concerned with the effects of cooking and freezing: fresh broccoli contained 620 to 1280γ carotene per 100 g.

634. Conroy, R. J.
Virus diseases of crucifers.
Agric. Gaz. N.S.W., 1960, **71**: 225-9, 246, bibl. 3, illus.

Symptoms of cauliflower mosaic and cabbage black ringspot viruses and recommended sprays for controlling their aphid vectors.

635. Hackel, E.
Zur Ätiologie einer Weichfäule des Chinakohls. (**The etiology of a bacterial rot of chinese cabbage.**) [English summary ¾ p.]
Phytopath. Z., 1960, **39**: 361-88, bibl. 31, illus.

Erwinia aroideae and *E. carotovora* were isolated as pathogens, and it was shown that they enter the plants by wounds made by insects and plant micro-organisms. The chief control measure is to prevent insect attack. Soil sterilization will also aid disease control. Temperature and humidity should be kept low in clamps and stores to restrict disease development.—Martin-Luther-Univ., Halle-Wittenberg.

636. Colhoun, J.
Club root disease of crucifers: some recent developments.
Gdnrs' Chron., 1960, **147**: 494-5, bibl. 13.

Host range, physiological specialization, breeding for disease resistance, epidemiology, control and contamination assessment discussed. [For a comprehensive review, see *H.A.*, 29: 415.]

637. MacFarlane, I., and Last, F. T.
Some effects of *Plasmodiophora brassicae* Woron. on the growth of the young cabbage plant.
Ann. Bot. Lond., 1959, **23**: 547-70, bibl. 41.

The inoculation of cabbage plants with *P. brassicae* resulted in a diversion of nutrients to the developing gall at the expense of shoots and fibrous roots, the production of fewer leaves, which were smaller and thinner, and a reduction in the amount of fibrous root per unit leaf area. The water content per unit dry weight of the shoot was not affected. Delayed inoculation resulted in a larger club, but as roots and tops had grown considerably before infection the plants were larger at harvest time. Damage to the plants depended on how long they had been infected rather than on their age at inoculation.—Rothamsted exp. Stat., Harpenden.

638. Rubin, B. A., and Ivanova, T. M.
The dynamics of phenols in the tissues of cabbage plants infected with *Botrytis cinerea*. [Russian.]
Doklady Akad. Nauk S.S.S.R., 1960, **131**: 445-8, bibl. 14.

In resistant and susceptible varieties.

639. Lowe, A. D.
Insect pests of brassicas.
Reprint from *Proc. 8th Lincoln Coll. Fmrs' Conf. 1958*, pp. 111-20, bibl. 10.

With a summary of control measures advocated in New Zealand.

640. Ministry of Agriculture, London.
Cabbage aphid.
Adv. Leafl. Minist. Agric. Lond. **269**, revised 1959, pp. 5, illus.

Brevicoryne brassicae and its control with demeton-methyl or schradan.

641. Kelsheimer, E. G.
A microbial pathogen for the control of certain cabbage and cauliflower insects.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 160-3, bibl. 5.

Inoculum of *Bacillus thuringiensis* sprayed on cabbage and cauliflower plants at ½, 1, 2 or 4 lb. per acre in 100 gal. water effectively controlled *Trichoplusia ni*, *Pieris rapae* and *Plutella maculipennis*.—Gulf Coast Exp. Stat., Bradenton.

642. Morris, R. F.
Control of the purple-backed cabbageworm in Newfoundland.
Publ. Canada Dep. Agric. **1077**, 1960, pp. 4, illus.

Recommendations arising out of experimental work on the control of *Evergestis pallidata* [see *H.A.*, 29: 421].

643. French, R. A., and White, J. H.
The diamond-back moth outbreak of 1958.
Plant Path., 1960, **9**: 77-84, bibl. 12.

A 0·1% DDT emulsion at 25 gal. per acre gave almost complete control of *Plutella maculipennis* on cruciferous crops.

644. Ministry of Agriculture, London.
Flea beetles.
Adv. Leafl. Minist. Agric. Lond. **109**, revised 1959, pp. 4, illus.

Control of *Phyllotreta* spp. and *Chaetocnema concinna* on crucifers.

645. Abu Yaman, I. K.
Natural control in cabbage root fly populations and influence of chemicals. [Dutch summary 4 pp.]
Meded. LandbHogesch., Wageningen, 1960, **60**(1): 1-57, bibl. 57, illus.

The abundance of cabbage root fly was studied in the field at Wageningen during 5 successive years. The factors affecting natural abundance were studied, and the relation between larval density and the damage caused to the host was investigated. Natural biological control was not sufficient to prevent considerable crop losses. Control of the larvae was equally good with aldrin and chlordane, but their effect on predator populations was uncertain.—Lab. Ent., Wageningen.

646. Read, D. C., and Lelacheur, K. E.
Note on the effectiveness of insecticides applied to mineral soils of various levels of acidity, with and without lime applications at time of seeding, in controlling root maggots attacking rutabagas.
Canad. J. Plant Sci., 1960, **40**: 578-9, bibl 1.

Neither the application of lime at sowing nor variations in the soil pH had any significant effect on the degree of control over root maggots, mainly *Hylemyia brassicae*, obtained by treating the soil before planting with heptachlor or parathion. The highest yields of roots with the cleanest appearance came from plots within the pH range 5·6 to 6·4. [For earlier work, see *H.A.*, 29: 488.]—Dep. Agric., Charlottetown, P.E.I.

Celery.

(*See also* 769.)

647. Round, K. M.
Celery growing in the Fens.
Agriculture, Lond., 1960, **67**: 189-91, illus.

Where raising and growing are separate specialized industries.

648. Gagnebin, F.
Analyses des caractères principaux de 16 variétés de céleris-raves. (**Analyses of the chief characteristics of 16 celeriac varieties.**)
Rev. hort. suisse, 1960, **33**: 150-2, 183-4, 199-204, 238-40, bibl. 5, illus.

The characteristics concerned are leaf colour, petiole colour, leaf position, foliage weight, formation of root suckers, stem: root ratio for the tuber, position and number of rootlets, size, colour and shape of tuber, and compactness of its internal tissues.—Stat. Bot. exp., Univ. Genève.

649. Burdine, H. W., and Guzman, V. L.
Effects of spacing between rows and between plants on growth and yield of three celery varieties.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 145-50, bibl. 3.

Two factorial experiments were conducted with the celery varieties Summer Pascal, Emerald and 52-70, spaced in rows 20, 24 and 28 in. apart with 6, 7 and 8 in. between plants in the row. Yields decreased as plant populations decreased, although plant type in 52-70 improved and average size increased in all varieties with wider spacing. For autumn and winter grown 52-70 a 7-in. plant spacing in 24-in. rows appears to be the most suitable.—Everglades Exp. Stat., Belle Glade, Fla.

650. Hall, C. B.
Composition and organoleptical differences between celery grown in Florida and California.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 142-5, bibl. 2, illus.

Four celery varieties were studied in April and 5 in May, but only one variety, 52-70, was grown in both locations. In general, Florida-grown 52-70 had a higher K content and lower Na, N and sugar contents than the California sample. The Florida-grown 52-70 was considered of better flavour in April and the California sample better in May. The K : Na ratio appeared to influence the intensity of celery flavour. [From author's summary.]—Fla agric. Exp. Stat., Gainesville.

651. Yamaguchi, M., Takatori, F. H., and Lorenz, O. A.
Magnesium deficiency of celery.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 456-62, bibl. 6, illus.

In a field experiment weekly and fortnightly sprays containing 0·1 lb. of magnesium sulphate per gal. were effective in counteracting a yellowing of celery. The plants became yellow again within 3 weeks of the last application. Leaves of chlorotic plants showed very low levels of Mg and high levels of Ca. In greenhouse experiments the chlorosis was most severe in plants grown in solutions containing high levels of Ca and low levels of Mg. Chlorosis usually occurred when the Mg content of leaflets was below 0·1%, but at high levels of Ca some chlorosis occurred when the Mg content was 0·2%. The evidence suggests that the chlorosis was due to Mg deficiency, which was intensified by high levels of Ca either in the nutrient solution or within the plant.—Univ. Calif., Davis and Riverside.

652. WOLCOTT, A. R., AND OTHERS.
Effects of Telone on nitrogen transformations and on growth of celery in organic soil.
Down to Earth, 1960, **16**(1): 10-14, bibl. 16, illus.

The application of 40 gal. per acre of Telone as a soil fumigant to peaty soils in both June and October resulted in a sharp depression of nitrifying activity and upset the balance between NO_3–N and NH_4–N. In the autumn treatment the nitrate content did not regain its normal level until the end of July the following year. The reduced NO_3 level caused chlorotic and retarded growth in celery, but it was shown that this could be counteracted by applying calcium nitrate.—Mich. agric. Exp. Stat., East Lansing.

653. BUKOVAC, M. J., WITTWER, S. H., AND COOK, J. A.
The effect of preharvest foliar sprays of gibberellin on yield and storage breakdown of celery.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **42**: 764-70, bibl. 9, illus.

Single and multiple preharvest foliar sprays of GA (50 and 100 p.p.m.) applied to field-grown celery during two growing seasons consistently increased petiole length by 4 to 24% as compared with that of non-treated controls. Increases in the fresh weight of trimmed stalks, however, were less consistent and depended upon variety and season. Preharvest treatment with GA significantly increased the amount of pithiness and browning of petioles of celery stalks stored in polythene-lined crates at 33 to 34° F. for 60 days. Less CO_2 (mg.CO_2/kg.) was evolved from GA-treated (100 p.p.m. three weeks before harvest) celery stalks stored at 32° F. than from those which were not treated. [From authors' summary.] Certain other deleterious effects such as petiole twisting, a shortened harvest period and seed stalk formation seem to have been directly related to GA treatment and may outweigh the advantage of increased yield.

654. COX, R. S.
Etiology and control of celery diseases in the Everglades.
Bull. Fla agric. Exp. Stats **598**, 1958, pp. 27, bibl. 12, illus.

Including results of control experiments in seed-bed and field.

655. BARON, C.
Céleris virusés. **(Virus-diseased celery and celeriac.)**
Bull. Hort. Liège, 1960, **15**: 293-5, illus.

Control of aphid vectors by insecticides and burning of infected plants recommended.

656. HARRISON, D. S., AND THAYER, P. L.
Comparison of an air carrier sprayer and a boom type sprayer for control of early blight on celery.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 139-41, bibl. 6.

Nabam + $ZnSO_4$ gave better control of *Cercospora apii* when applied by a boom sprayer than when applied by an air carrier sprayer.

657. FELDMAN, J. M., AND PONTIS, R. E.
La podredumbre rosada del apio en la Argentina causada por *Sclerotinia sclerotiorum*. **(Pink rot of celery in Argentina caused by *Sclerotinia sclerotiorum*.)**
Rev. argent. Agron., 1960, **27**: 15-26, bibl. 42, illus.

The disease is new to Argentina; control measures are reviewed.

658. PARSONS, C. S.
Effects of temperature, packaging and sprinkling on the quality of stored celery.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 463-9, bibl. 12.

Celery packaged by different methods was stored experimentally at 3 temperatures for periods up to 8 weeks. Celery kept better at 32° and 38° than at 45° F., and better at 32° than at 38° when held for 5 weeks or longer. Weight losses of celery stored at a relative humidity of approximately 90% were sufficiently great in unlined crates (10 to 20% of the original weight) to produce serious wilting at all temperatures. Wrapping the celery in parchment reduced weight losses slightly but did not eliminate wilting. Similar results were obtained by sprinkling. Polythene crate liners and individual bags eliminated wilting and maintained the highest percentage of edible celery. Trimming losses in unbagged celery were not reduced by storing the celery in perforated polythene bags but were reduced by storing the celery in non-perforated bags. [From author's summary.]—U.S.D.A., Beltsville, Md.

659. HALL, C. B.
Prevention of the butt discoloration of prepackaged celery.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 280-4, bibl. 1, illus.

Dipping clean celery to a depth of 3 in. into 1% sodium dehydroacetate or 1·5% potassium sorbate effectively prevented butt discoloration.—Fla agric. Exp. Stat., Gainesville.

660. HALL, C. B.
Observations on celery flavors.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 284-5, bibl. 2.

In addition to normal celery flavour of various intensity, bitter, coconut, sweet, salty and other types of flavour were noted.

Cucurbits.

(*See also* 30, 47, 48, 93, 107, 119, 156, 168, 194, 557, 597, 600, 602, 603, 1203.)

661. LEVONEN, H. J.
An important crop to the Finns.
Grower, 1960, **54** (Glasshouse Suppl.): 13-14.

Methods of growing cucumbers in Finland differ markedly from those practised in England.

662. BALÁZS, S.
A csányi zöldségtermesztés. (**Vegetable cultivation in Csány.**)
Kert. szől. Főisk. Évk., 1958 (issued 1959), **22** (6, part 8): 3-15, bibl. 5, illus.

Intensive outdoor cultivation of cucurbits in Hungary for home consumption and export.

663. OVEČKA, V.
Studie o možnosti zvýšení vitality a odolnosti proti nepříznivým klimatickým vlivům u okurek znojemských nakládaček. (**Studies on the possibility of increasing the vitality and resistance to unfavourable climatic conditions of Znojmo pickling cucumbers.**) [Russian and German summaries ½ p. each.]
Acta Univ. Agric., Brno, Ser. A, 1959, Special No., pp. 123-7, bibl. 23.

Promising results from intervarietal crossing.

664. RIES, S. K.
Double your cucumber yield.
Amer. Veg. Gr, 1960, **8**(5): 12, 38-9, illus.

Under Michigan conditions the most profitable spacing for field cucumbers appears to be 12 in. apart in rows 40–48 in. apart. Mosaic and scab resistant varieties, such as Wisconsin SMR-12, SMR-15, SMR-18 and SMR-58, are recommended. The plants have responded most to P, and 300–500 lb. per acre of a 5–20–10 or 4–24–12 fertilizer are adequate, the lower rate being sufficient if band application 2 in. below and 2 in. to the side of the seed is possible. Two harvesting machines are on trial.

665. BRADLEY, G. A., AND FLEMING, J. W.
The effects of position of leaf and time of sampling on the relationship of leaf phosphorus and potassium to yield of cucumbers, tomatoes and watermelons.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 617-24, bibl. 14.

A good correlation was obtained between leaf K content early in the season and cucumber yields, and between P content early in the season and tomato yields. The correlation was lower in both cases with later sampling. The correlation between P and K contents and watermelon yields was not as high as for cucumbers and tomatoes, possibly because a yield response was obtained only to additions of both elements. When results of minus-P and minus-K treatments were excluded, the correlation between yield and P and K contents was much higher. In early season comparisons between leaf samples of different physiological age, there was no advantage in using younger rather than older leaves. No late comparisons were made. [From authors' summary.]—Univ. Ark., Fayetteville.

666. EDWARDS, C. A., AND GUNN, E.
Autumn tests show better ways to control millipedes.
Comm. Gr, 1960, No. 3376, p. 591, illus.

Several insecticidal soil drenches were applied round cucumber plants without any apparent damage. One week after treatment, parathion was the most effective of the materials tested, since it appeared to have some systemic effect. Nicotine gave about 50% mortality at first but its effect did not persist; the initial effectiveness of nicotine was increased by sealing the soil with polythene sheets for about 3 days after application. Lindane and dieldrin gave 50% mortality after one week, and both materials were still giving effective control a month after treatment.—N.A.A.S., S.W. Region.

667. CHAUMIER, P.
Production de melons à contre saison à Cavaillon. (**Out of season production of melons at Cavaillon.**)
Rev. hort. Paris, 1960, **132**: 2240-1, illus.

The seeds are sown at the end of August, and the plants grown under glass with soil heating by low temperature heaters, air heating by electric radiators and time-controlled fluorescent illumination. The fruits ripen early in January.

668. JAMES, E., MASSEY, J. H., AND CORLEY, W. L.
Effect of a plant arrangement on cross-pollination of muskmelons.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 480-4, bibl. 6.

Planting systems developed at Georgia Exp. Stat. that will allow the seed produced to be selfed or sibbed without hand-pollination.

669. BROWN, R. T., ADAMS, A. J., AND MULLER, J. C.
Delta Gold, a new variety of cantaloupe.
Circ. La agric. Exp. Stat. **62**, 1960, pp. 3, illus.

Similar to Imperial 45 with salmon flesh, weight 2–4 lb., resistant to mildews and high yielding.

670. HARRINGTON, J. F., AND KIHARA, G. M.
Chilling injury of germinating muskmelon and pepper seed.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 485-9, bibl. 8, illus.

When seeds of the warm-season crops muskmelon and capsicum were sown at temperatures of 0–10° C., no germination occurred. When these seeds were transferred to a temperature of 15° C., they germinated, but a large percentage of the seedlings developed symptoms of chilling injury, namely, collapse of the cells 1–2 mm. behind the root tip and necrosis followed quickly by rotting.—Univ. Calif., Davis.

671. MASUI, M., AND OTHERS.
Studies on the absorption of nutrient elements in muskmelon. I. On nitrogen and phosphorus levels. [Japanese, with English summary ½ p.]
J. hort. Ass. Japan, 1960, **29**: 12-20, bibl. 8.

The results are presented of analyses of Earl's Favourite musk melons grown under glass with different levels of N and P and constant K. Increasing the amounts of N reduced the soluble solids, the weights of the leaf, stem and fruits, and the Ca, Mg and K contents of the whole plant. The N content of the whole plant, however, was increased. Increasing the P level promoted vigorous growth, improved the external appearance and raised the fruit and seed weights and the amounts of N, P and K in the plants. The soluble solids were again reduced. Interactions between N and P levels were noted with regard to the N, K and Mg contents of the plants. The recommended dosage for musk melons is 12 g. N and 18 g. P_2O_5 per plant.

672. HALL, C. V., AND OTHERS.
Inheritance of resistance to the fungus *Colletotrichum lagenarium* (Pass.) Ell. and Halst. in watermelons.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 638-43, bibl. 6, illus.

Resistance of 5 varieties and their progeny to 2 strains of the fungus.

673. HALSEY, L. H.
Watermelon spacing and fertilization.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 131-5, bibl. 2.

In 1958 and 1959 Charleston Gray watermelons were spaced 3, 6, 9 and 12 ft. apart in rows 10 ft. apart and each spacing treatment received 6–8–8 fertilizer at 500, 1,000, 1,500 and 2,000 lb. per acre (plus a top-dressing in 1959). In both years the number of marketable melons per acre increased as the spacing was decreased, but only in 1959 did increased rates of fertilizer increase the number of melons significantly. An increase in the size of the melons due to wider spacing and higher fertilizer rates was also significant only in 1959. The highest yield was obtained from plants spaced at 3 ft. apart and fertilized at 2,000 lb. per acre.—Fla agric. Exp. Stat., Gainesville.

674. BRANTLEY, B. B., AND WARREN, G. F.
Effect of nitrogen on flowering, fruiting, and quality in the watermelon.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 644-9, bibl. 17.

Applications of N increased the number of pistillate flowers and fruits set in experiments conducted on Princeton fine sand in 1956 and 1957. The response to N applications was greater in 1957, a season of heavy rainfall. Only slight increases were obtained at rates above 100 lb. N per acre in 1956 and at rates above 150 lb. in 1957. Percentage fruit set, early and total marketable yields and fruit size were increased by N under conditions of heavy rainfall, but not in a season of slightly below normal rainfall. High levels of N promoted earlier pistillate flower development and fruit set, but at these levels the developing fruits depressed subsequent flowering and fruit set. N level had no effect on the percentage of soluble solids. Pruning fruits to 2 or 3 per plant until 3 weeks before the first harvest increased the average size of the melons but had no significant effect on yield. [From authors' summary. See also *H.A.*, 29: 2466.]—Purdue Univ., Lafayette, Ind.

675. WATERS, W. E.
The influence of calcium on the growth, yield, quality, and chemical composition of watermelons, *Citrullus vulgaris* Schrad.
Diss. Abstr., 1960, **20**: 4483, being *L.C. Card No. Mic.* 60-1910 of 121 pp.

In a glasshouse Charleston Gray watermelons grown in a nutrient solution containing only 4 p.p.m. Ca showed the first signs of Ca deficiency, in both roots and vines, 3 weeks after transplanting. At 8 p.p.m. Ca deficiency was observed in the roots only. The dry weights of vines and roots decreased linearly when measured against the logarithms of Ca levels, although total dry weight (including fruit) showed no significant decrease. The numbers and weights of early and total marketable watermelons in the field responded to increasing Ca levels by a significant linear increase. Nitrogen had no effect on yield. The average ratio of staminate to pistillate flowers of Ca-deficient glasshouse plants (at 4 p.p.m.) was 27·8 : 1. At 8 p.p.m. Ca the ratio was 8·7 : 1, but there was no further significant change with increasing Ca levels up to 256 p.p.m. There was no fruit set at 4 or 8 p.p.m. Ca, but from 16 p.p.m. upwards there were no significant differences in fruit set. In the field total fruit set increased quadratically with increasing Ca. A large percentage of the ovaries in plants grown at 4 and 8 p.p.m. rotted even before flowering, but the percentage of such rot in the field could not be related to treatment. Rind thickness at the blossom-end of the fruit decreased linearly with Ca increments. Watermelon plants contained relatively large quantities of Ca (up to 9·9%), K (up to 5·9%) and Mg (up to 1·11%), depending on ion concentration and balance in the substrate, the age of the plant and sampling position. The percentage of Ca increased and the percentages of K and Mg decreased in various parts of watermelon plants, when measured against the logarithms of increasing Ca with glasshouse plants and against pounds of hydrated lime applied with field-grown plants. The influence of N was not consistent.—Univ. Fla.

676. Byvših, N. A.
The amino acid content of the globulins in watermelon seeds at various stages of maturity. [Russian, with English summary ⅓ p.],
Fiziol. Rast., 1960, **7**: 335-9, bibl. 9.

The amino acid content of the seed globulins in an early and a late watermelon variety differed at all stages of maturity.

Legumes—beans.

(*See also* 15, 18, 58, 59, 63, 67, 68, 77, 90, 97-101, 157, 600, 602, 799, 916, 1645.)

677. Anon.
Non-climbing runner bean useful for cloche work.
Grower, 1960, **54**: 343, illus.
New dwarf scarlet runner is early and crops 12 weeks.
Comm. Gr, 1960, No. 3372, p. 345, illus.

Seed of Hammonds Dwarf Scarlet will be available for the 1961 season. Pods are 9 in. long, tender, of good shape and colour and with no tendency to curl. Under trial the variety has flowered 11 days and cropped 10 days earlier than normal runner beans.

678. Vieira, C.
Manteigão Fôsco-11, variedade de feijão para a Zona da Mata, Minas Gerais. **(Manteigão Fôsco-11, a bean variety for the Zona da Mata, Minas Gerais.)** [English summary ¼ p.]
Rev. Ceres, 1960, **11**: 98-102, bibl. 4, illus.

Description of a bush variety resistant to both anthracnose (*Colletotrichum lindemuthianum*) and rust (*Uromyces phaseoli* var. *typica*).

679. Mancini M., S., and Castillo D., M. A.
Observaciones sobre ensayos preliminares en el cultivo asociado de fríjol de enredadera y maíz. **(Observations on preliminary mixed cropping trials with climbing beans and maize.)**
Agric. trop. Bogotá, 1960, **16**: 161-6, bibl. 2, illus.

Of the 25 bean varieties sown with maize, 20 gave higher yields than the 2 local varieties, Ecuador 51 giving outstanding results without reducing the maize yield below an economic level. Sowing the bean and maize seeds together in holes 70 cm. apart was more profitable for both crops than alternating beans and maize every 35 cm. The rows in each case were 90 cm. apart. Thinning to one bean plant and 2–4 maize plants per group was a satisfactory arrangement. The more vigorous bean varieties needed 3 or 4 maize plants for support. In further experiments differential sowing dates will be investigated.

680. Campbell, J. S., and Hodnett, G. E.
Spacing experiments with dwarf beans (*Phaseolus vulgaris* L.) in Trinidad.
Trop. Agriculture Trin., 1960, **37**: 265-70, bibl. 4.

The population which gave the maximum financial return was 110,000 plants per acre, achieved by planting 2 rows 12 in. apart on raised beds 24 in. wide and separated by furrows 18 in. wide, with a spacing between the plants of 2½ in. to 3 in.—Imp. Coll. trop. Agric., Trinidad.

681. Löhnis, M. P.
Effect of magnesium and calcium supply on the uptake of manganese by various crop plants.
Plant and Soil, 1960, **12**: 339-76, bibl. 28, illus.

The crops included *Phaseolus vulgaris* and *Cichorium intybus*. With beans acid soil injury associated with excess Mn was reduced by fertilizing with Mg [for earlier work, see *H.A.*, 26: 1753]. Field experiments with chicory pointed to an influence of Mg on Mn uptake, but, when plants were cultured in solution, Mn excess and Mg deficiency were shown to act independently, and both were injurious to the plants.—Lab. Microbiol., agric. Univ., Wageningen.

682. Bukovac, M. J., Teubner, F. G., and Wittwer, S. H.
Absorption and mobility of magnesium^{28} in the bean (*Phaseolus vulgaris* L.).
Proc. Amer. Soc. hort. Sci., 1960, **75**: 429-34, bibl. 13, illus.

Foliar-applied Mg^{28} was readily absorbed (10% in 24 hours) but was not translocated out of the treated primary leaves of seedling or fruiting bean plants within 24 hours. Mg applied to the root medium was absorbed and distributed throughout the plant. In fruiting plants 33% of the root-absorbed Mg^{28} was recovered in the stem and 32% in the pods and seeds. The primary leaves accumulated the least (5%), and the trifoliate leaves intermediate amounts (13–16%). [Authors' summary.]—Mich. St. Univ., E. Lansing.

683. Bardsley, C. E.
Absorption of sulfur from organic and inorganic sources by bush beans.
Agron. J., 1960, **52**: 485-6, bibl. 7.

The beans were grown in culture solution with cystine, cysteine-HCl, DL-methionine, sulphanilic acid and gypsum as S sources. Growth of the bean tops was significantly greater with either methionine, gypsum or cystine, but not with sulphanilic acid or cysteine, than with no S. Root growth was significantly increased only with cystine. The S absorbed by bean tops and roots was significantly increased where methionine, cysteine, gypsum or cystine were supplied.—U.S.D.A., St. Coll., Miss.

684. Leiser, A. T., Leopold, A. C., and Shelley, A. L.
Evaluation of light sources for plant growth.
Plant Physiol., 1960, **35**: 392-5, bibl. 8.

Red kidney beans were grown under five light regimes for 10-day periods. Total watts radiant power input, between 4,000-7,600 Å, were plotted against dry weight gain per plant per day, and the position and slope of the response curve taken as a measure of the worth of the light source for plant growth. The bean plant does not respond to increases in fluorescent light alone above 1,000 f.c., but the addition of some other types of lamp can greatly increase both the growth rate and the total radiant energy utilizable.—Purdue Univ., Lafayette, Indiana.

685. El-Fadl, M. A., El-Sherbeni, M. F., and Fahmy, M.
An analysis of some factors affecting root-nodule formation in garden bean in Egypt.
Agric. Res. Rev. Cairo, 1959, **37**: 269-72, bibl. 4.

The application of calcium nitrate at the rate of 50 kg. per acre to beans inoculated with a pure strain of *Rhizobium phaseoli* had a stimulating effect on nodule formation in both pot and field tests, but with higher rates of application the nodules partially or completely disappeared.

686. Clode, J. J.
Note on gibberellin-like excretions from germinating beans.
Portugal. Acta biol., 1959, **6**: 75-6, bibl. 5, illus.

Distilled water in which dwarf beans (*Phaseolus vulgaris* var. Limbourg) were germinating was applied weekly to the young leaves of seedlings of the same variety growing in pots of soil. There was a visible response even to the first treatment, and by the 5th week the treated seedlings had larger and much paler leaves, longer internodes and poorer root systems than the controls.—Inst. sup. Agron., Tapada de Ajuda, Lisbon.

687. Alvim, P. de T.
Net assimilation rate and growth behavior of beans as affected by gibberellic acid, urea and sugar sprays.
Plant Physiol., 1960, **35**: 285-8, bibl. 3.

Seedlings grown in Hoagland's nutrient solution received the following treatments: (1) control; (2) 10% sucrose spray; (3) 2% urea spray; (4) 50 p.p.m. gibberellic acid spray; (5) sucrose plus urea; (6) sucrose plus GA; (7) urea plus GA; and (8) sucrose plus urea plus GA. GA accelerated the movement of photosynthates from the leaves, probably through its effect on stem elongation. The reduction in root dry weight induced by GA was offset by the 10% sucrose spray. Urea increased stem elongation in plants receiving GA. Both sugar and GA were effective in protecting plants against injury by 2% urea sprays.—Inter-Amer. Inst. agric. Sci., Lima.

688. Vieira, C.
As doenças do feijoeiro (*Phaseolus vulgaris* L.) na Zona da Mata, Minas Gerais. **(Diseases of beans (*Phaseolus vulgaris*) in the Zona da Mata, Minas Gerais.)** [English summary 1 p.]
Rev. Ceres, 1960, **11**: 73-91, bibl. 54, illus.

Of 54 bean varieties studied 6 were resistant to both anthracnose (*Colletotrichum lindemuthianum*) and rust (*Uromyces phaseoli* var. *typica*). The measures recommended against anthracnose are:—the use of disease-free seed, crop rotation, breeding for resistance, and spraying plants and seeds with fungicides. Rust is controlled by preventive and curative dusting with sulphur. Infected plants should be burnt after harvesting. Root rots caused by various fungi can be controlled by various seed and soil treatments, improved drainage, crop rotation and selection of resistant varieties. Brief notes on control are included for the diseases of minor importance in the area, *viz.* virus mosaic, angular leaf spot (*Isariopsis griseola*), mildew (*Erysiphe polygoni*) and root knots caused by nematodes.

689. Ujević, I., and Staněk, M.
Použití fytoncidů česneku k moření semen fazole proti anthraknoze způsobené houbou *Colletotrichum lindemuthianum* (Sacc. et Magn.) Bri. et Cav. a proti skvrnitosti vyvolávané bakterii (*Xanthomonas phaseoli* (E. F. Smith) Dowson. **(The use of phytoncides of garlic to treat bean seeds against anthracnose caused by the fungus *Colletotrichum lindemuthianum* and common blight caused by the bacterium *Xanthomonas phaseoli*.)** [English, Russian and German summaries ¾ p. each.]
Rostlinná Výroba, 1960, **6**: 237-52, bibl. 14, illus.

Experiments *in vitro* having shown phytoncides of garlic to inhibit *Xanthomonas phaseoli* and *Colletotrichum lindemuthianum*, bean seeds were soaked in suspensions of 1 to 30 parts of garlic purée in 100 parts of water for 24 and 48 hours. The most effective treatment was 48 hours' soaking in a 4 : 100 suspension. Germination was reduced by the treatment, but later growth was unchecked. In 1957 when 20% of the seeds used showed symptoms of anthracnose the treatment increased the yield of green pods by 267% above that obtained from untreated seeds. Similar results were obtained in 1958. The weight of seeds harvested from the treated plots was 2·7 times that from the controls, and 90·7% of the seeds were healthy compared with 16·4% in the controls.

690. Walker, J.

Two seed-borne fungi of french bean—*Phaseolus vulgaris* L.

J. Aust. Inst. agric. Sci., 1960, **26**: 60-3, bibl. 12, illus.

Reports transmission of *Rhizoctonia* sp. and *Sclerotinia sclerotiorum* in samples of Brown Beauty and Hawkesbury Wonder seed in New South Wales.

691. Mastenbroek, C.

A breeding programme for resistance to anthracnose in dry shell haricot beans, based on a new gene.

Euphytica, 1960, **9**: 177-84, illus.

A dominant gene governing resistance found in Cornell 49–242, a black bean.

692. Toussoun, T. A., Nash, S. M., and Snyder, W. C.

The effect of nitrogen sources and glucose on the pathogenesis of *Fusarium solani* f. *phaseoli*.

Phytopathology, 1960, **50**: 137-40, illus.

In a mycological study with beans grown in culture solution in a greenhouse the development of the disease in the plants was enhanced by N nutrition and delayed by glucose nutrition.—Univ. Calif., Berkeley.

693. Smith, F. L., and Houston, B. R.

Root rot resistance in common beans sought in plant breeding program.

Calif. Agric., 1960, **14**(9): 8.

Large-scale testing of varieties and hybrids at Univ. Calif., Davis.

694. N.S.W. Department of Agriculture, Entomology Branch.

Bean fly (*Agromyza phaseoli*).

Agric. Gaz. N.S.W., 1960, **71**: 241, illus.

Coloured illustration and notes on control with DDT, dieldrin, lindane, parathion and diazinon.

695. Stone, M. W., Foley, F. B., and Campbell, R. E.

Field tests with various insecticides for the control of lygus bugs and the corn earworm on lima beans.

J. econ. Ent., 1960, **53**: 397-403, bibl. 4.

The best control of lygus bugs, chiefly *Lygus hesperus*, was given by dieldrin, toxaphene, endrin, DDT-toxaphene and DDT, in that order. In reducing pitting of beans caused by lygus feeding, DDT-toxaphene was the most effective and this combination also resulted in the highest yield of dry beans. Endrin was the most effective for the combined control of lygus and corn earworm (*Heliothis zea*), but toxaphene, DDT-toxaphene and DDT, which were also good, were cheaper.—Agric. Res. Serv., U.S.D.A.

696. Bielarski, R. V.

The effect of different levels of inorganic phosphorus in the growing medium on the absorption, translocation and detoxification of Systox and Thimet in lima bean plants.

Diss. Abstr., 1960, **20**: 4463, being *L.C. Card No. Mic.* 60-1422 of 98 pp.

Increasing the amounts of inorganic P decreased the amount of Systox and Thimet absorbed by the roots and translocated to the foliage. Systox and Thimet had no effect on the oxygen consumption of leaves. More of the insecticides was detoxified in plants growing in a high P sand than in a low P sand. The P level had less effect on the rate of absorption through the foliage than through the roots. Plants growing in low P nutrient solutions absorbed more solution than plants growing in high P nutrient solutions. When Systox and Thimet were added to the nutrient solutions there was a decrease in the volume of solution absorbed.—Rutgers Univ.

697. Guyer, G., and others.

An evaluation of systemic insecticides for control of insects on snap and field beans.

Quart. Bull. Mich. agric. Exp. Stat., 1960, **42**: 827-35, bibl. 7, illus.

The application of the systemic materials directly to the seed often resulted in serious phytotoxicity problems. A 1-lb. application of phorate or Di-syston, applied as a granulated formulation, significantly increased the yield of snap beans, as well as reducing Mexican bean beetle damage and the incidence of bean mosaic. In the Sanilac, Michelite, and cranberry varieties of field beans [types of *Phaseolus vulgaris* grown for seed], there was no significant increase in the yields resulting from systemic treatments. When granulated phorate was applied with fertilizer to the dark red kidney variety of field beans, there was a significant increase in yield. Snap beans treated with phorate seed treatment as well as granulated formulations had no toxic residues in the harvested product. Field beans treated with phorate granulated formulations had no toxic residues in the dried beans at harvest. [Authors' summary.]

698. Matsumura, F.

Malathion residues on and in the leaves of *Phaseolus vulgaris*.

J. econ. Ent., 1960, **53**: 452-4, bibl. 11.

When P^{32}-labelled malathion was injected into the stems of bean plants, the rate of translocation into the leaves was very slow. Malathion from surface applications was taken up rapidly by the leaf tissues. Dissipation of malathion residues was rapid at first but then slowed down, owing to a lower rate of evaporation resulting from the absorption of the insecticide by plant tissues.— Univ. Alberta, Edmonton, Canada.

699. Panos, D. A.
A contribution to explaining the potential variability of *Vicia faba* L. [Dutch summary 8 lines.]
Euphytica, 1960, **9**: 57-73, bibl. 40, illus.

The productivity of broad beans could only be maintained by continuous positive selection of the best plants and keeping the material as pure as possible.—Hellenic agric. Res. Stat., Larissa, Greece.

700. Scholz, G.
Physiological effect of boron on seedling roots of *Vicia faba*. [German?]
Flora, 1959, **148**: 295-305, from abstr. in *J. Sci. Food Agric.*, 1960, **11**: ii-103.

In a B-free medium the O_2 uptake of the rapidly growing roots was restricted; the water content of the root tips increased and the sugar content decreased. The soluble-N and protein-N contents were unaffected, but the amount of soluble-N towards the base of the root tended to increase.

701. Evans, L. T.
Environmental control of flowering in *Vicia faba* L.
Ann. Bot. Lond., 1959, **23**: 521-46, bibl. 22.

An increase in photoperiod length increased the rate of leaf appearance and flower initiation, and all except the earliest-flowering stocks showed a quantitative long-day response. Flower initiation was accelerated in all except the earliest-flowering stocks by short periods of vernalization. The response was more rapid at 10° C. than at 4° C., but it eventually reached saturation at both temperatures, after which further exposure to low temperatures delayed flower initiation. Long dark periods at high temperatures also inhibited flower initiation, but in late-flowering stocks this effect was overcome by subsequent vernalization. When the vernalization effect had reached saturation, the plants were no longer susceptible to high temperature inhibition.—Calif. Inst. Tech.

702. Inoue, Y., and Suzuki, Y.
Studies on the fertility of pollen of the broad bean, *Vicia faba* L. [Japanese, with English summary $\frac{1}{3}$ p.]
J. hort. Ass. Japan, 1960, **29**: 7-11, bibl. 8.

The most suitable germination medium was 1% agar plus 10% sucrose, and the optimal pH was 7·0. Varietal differences amongst 4 varieties were inappreciable, but considerable differences were found in pollens obtained at various stages of bud development. Germination was retarded when the flowers were soaked in water at normal temperatures (10–20° C.) for more than 20 min., and it was inhibited if the soaking took place in water at 40° C. for 5 min. The retarding effects of soaking and high temperature were additive. Viability was retained for 3–4 days after picking the flowers.

703. Robinson, A. G.
Effect of maleic hydrazide and other plant growth regulators on the pea aphid, *Acyrthosiphon pisum* (Harris), caged on broad bean, *Vicia faba* L.
Canad. Ent., 1960, **92**: 494-9, bibl. 7.

When MH, 2,4-D, 2,4,5-T, MCPA, 2,4-DES, erbon, carbyne and potassium gibberellate were applied by a leaf-dipping technique to broad beans, there was no appreciable adult or nymphal mortality or reduced fecundity among aphids caged for 5 days on the treated plants. However, in all tests where MH was applied by root absorption for 48 hours at rates of 4,000, 3,000 and 2,000 p.p.m. of active ingredient, there was nymphal mortality and significant reductions in fecundity. When adult aphids were caged for 5 days on plants treated with MH, and then transferred for 5 days to untreated plants, they continued to show a reduced fecundity. When nymphs born and reared on plants treated with MH were transferred for their adult life to untreated beans, they also showed a reduced fecundity. When adult aphids were sprayed directly with MH at 4,000 p.p.m. and then caged for 5 days on untreated bean plants, there was no adult mortality and no reduction in fecundity. [From author's summary.]—Univ. Manitoba, Winnipeg.

704. Müller, H. J., and Hennig, E.
Über die Ursachen der unterschiedlichen Resistenz von *Vicia faba* L. gegenüber der Bohnenblattlaus, *Aphis* (*Doralis*) *fabae* Scop. VI. Die Resistenzerscheinungen an Reisern reziproker Pfropfungen anfälliger und resistenter Ackerbohnen. **(The cause of variable resistance of *Vicia faba* to the bean aphid, *Aphis* (*Doralis*) *fabae*. VI. The resistance of scions from reciprocally grafted susceptible and resistant field beans.)** [English summary $\frac{1}{2}$ p.]
Ent. exp. appl., 1960, **3**: 157-70, bibl. 15, illus.

The preference-nonpreference aspect and the antibiotic mechanism of aphid resistance of resistant and susceptible beans was not altered as a result of reciprocal grafting. The grafting technique used is illustrated.—Dtsch. Akad. Landwirtschaftsw., Berlin.

Legumes—peas.

(*See also* 85, 97, 104-106, 120, 126, 602, 768.)

705. Vittum, M. T., Sayre, C. B., and Clark, B. E.
Experiments with an improved drill for fertilizing and planting processing peas.
Bull. N. Y. agric. Exp. Stat. **787**, 1960, pp. 34, bibl. 9, illus.

The drill was designed to place the fertilizer in a band to the side of each row at depths of 0–5 in.

below the seed level, to space the seed uniformly, to drill at a uniform depth and to press the soil uniformly round the seed, finally covering it with loose soil. No improvement in spacing was noticed and fractionally less injury to the seed was obtained, but the fertilizer placement and uniformity in depth of sowing and in soil compaction led to economy in the fertilizer used and to higher yields.

706. ISHIKAWA, S.
Physiological studies on seed germination. II. Effect of coumarin on respiration by germinating seeds.
Kumamoto J. Sci., Ser. B, 1958, **4**: 9-15, from *Biol. Abstr., Sect. D*, 1960, **35**, Abstr. 24,833.

The germination of pea seeds treated with 100 and 500 p.p.m. of coumarin was reduced by 32%, but their uptake of oyxgen increased by 8%. Germination ceased following treatment with 1,000 p.p.m., although there was little effect on respiration. When low concentrations of coumarin were used together with 2,3-dimercaptopropanol no coumarin effects were observed.

707. GOTTSCHALK, W., AND WEILING, F.
Über die Ursachen der Chimärenbildung nach Samenbestrahlung bei *Pisum sativum*. **(On the causes of chimera formation in *Pisum sativum* following seed irradiation.)**
Naturwissenschaften, 1960, **47**: 115-16, bibl. 2.

708. BROUWER, R.
Diffusible and exchangeable rubidium ions in pea roots.
Acta bot. neerl., 1959, **8**: 68-76, bibl. 14.

Experiments are described in which it is shown that exchangeable rubidium ions in pea roots are transported to the shoots. The rate of this translocation is dependent on the transpiration rate. The exchangeable ions are released by the tissue to the xylem vessels without leaching out towards the medium. It is suggested that this indicates the presence of an ion barrier in the plasmalemma. The apparent free space is thought to be localized at the root surface and in the cell walls of the cortex, whereas the exchangeable ions are found in the protoplasm [of the root cells]. [Author's summary.]—Bot. Lab., Groningen.

709. CHUBB, W. O., AND OTHERS.
[Weed control in] field and canning peas.
Res. Rep. west. Sect. nat. Weed Cttee Canada, 1959, pp. 91-3.

Three reports are summarized. In a pre-emergence test on Arthur peas yield did not appear to be correlated with weed control, and in a post-emergence test with the same variety the unweeded controls outyielded the treated plots.—From *Weed Abstr.*, **9**, No. 944.

710. BREWER, D.
Studies in *Ascochyta pisi* Lib.
Canad. J. Bot., 1960, **38**: 705-17, bibl. 4.

Continuing the work recorded in *H.A.*, 24: 1577, penetration studies have shown that, whereas the immunity of the pea variety A-100 to the blight organism is due to the physical barrier of the cuticle, the resistance of the variety O.A.C. 181 is both physical and physiological. This physiological resistance was shown to be affected by the temperature to which the plants were subjected following incubation, resistance being greater at higher temperatures.—Univ. Toronto.

711. LOCKWOOD, J. L., AND BALLARD, J. C.
Evaluation of pea introductions for resistance to *Aphanomyces* and *Fusarium* root rots.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **42**: 704-13, bibl. 8, illus.

No pea variety was found to be immune to *A. euteiches* or to *F. solani* f. *pisi*. Of the 805 accessions tested against *Aphanomyces* only 18 were rated at less than 5 on a 0–8 scale of infection. Against *Fusarium* 69 introductions out of 793 tested were rated at 1–3 on a 0–9 scale of infection. [The technique used was noted in *H.A.*, 30: 692.]

712. EWING, S.
Factors for resistance to pre-emergence decay of peas (*Pisum sativum*).
Proc. Carib. Reg. Amer. Soc. hort. Sci., 1957, 1958, **5**: 52-4.

The pea varieties which were most resistant to pre-emergence damping-off (mainly caused by *Pythium ultimum* and *Fusarium* sp.) were G-141 (an unnamed Turkish variety), G-213 (an unnamed Indian variety) and an F_7 progeny from a cross between New Era and the Turkish variety. Further studies are planned.—Secr. Agric. Ganad., Mexico.

713. KING, T. H., AND OTHERS.
Development of lines of *Pisum sativum* resistant to fusarium root rot and wilt.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 510-16, bibl. 13, illus.

A large-scale programme of introduction, selection and breeding that has resulted in relatively resistant lines with desirable canning quality.

714. BUXTON, E. W.
Effects of pea root exudate on the antagonism of some rhizosphere micro-organisms towards *Fusarium oxysporum* f. *pisi*.
J. gen. Microbiol., 1960, **22**: 678-89, bibl. 10, illus.

Growth and sporulation of rhizophere organisms, which inhibited the pathogenic *Fusarium*, were stimulated by root exudates of the wilt-susceptible pea variety Onward.—Rothamsted exp. Stat., Harpenden.

715. AUCLAIR, J. L., AND CARTIER, J. J.
Effets sur le puceron du pois, *Acyrthosiphon pisum* (Harr.) (Homoptères: Aphididae), de périodes de jeûne et de subsistance sur des variétés résistantes. **(Effects on the pea aphid of periods of starvation and of feeding on resistant varieties.)** [English summary 8 lines.]
Ann. ent. Soc. Quebec, 1958, 1960, **4**: 13-16, bibl. 6.

The weight of aphids reared continuously on the resistant pea variety Onward was comparable to that of aphids starved for 10 hours daily. The weight of aphids reared on Onward for 14 hours daily was comparable to that of aphids starved for 8 hours daily. In each of the above cases the remainder of each day was spent on the susceptible variety Perfection. Aphid growth on resistant Onward was therefore similar to that of aphids subjected to semi-starvation. Similar results were obtained when the rate of aphid reproduction was measured. [From authors' summary.]—Lab. rech., Saint-Jean, Québec.

716. FRANSSEN, C. J. H.
Het vaststellen van de door de erwteknopmade (*Contarinia pisi*) veroorzaakte schade en de bestrijding van dit insekt. **(The determination of damage caused by the pea midge and the control of this insect.)** [English summary ¼ p.]
Tijdschr. PlZiekt., 1960, **66**: 249-58, bibl. 28, illus.

Methods of calculating crop losses due to *Contarinia* attack are discussed, and it is considered that the most useful method is to compare average yields from crops sprayed for *Contarinia* control with untreated crops from the same area. This method is most accurate when damage is heavy.—I.P.O., Wageningen.

717. NOLTE, H.-W.
Untersuchungen zur Bekämpfung des Erbsenwicklers (*Laspeyresia nigricana* Steph.). **(Studies on the control of the pea moth.)** [Russian and English summaries 14 lines each.]
Albrecht-Thaer-Arch., 1959, **3**: 146-57, bibl. 21.

Certain cultural measures, such as early sowing, the choice of early-flowering varieties with short stems, exposure to wind and mixed cultivation with oats and mustard, reduced the severity of pea moth attacks. Where chemical treatment was required, a thiophosphoric acid ester preparation proved successful. Spraying should be carried out when the first pods begin to swell in the region of the ovule. A second application may be necessary later.—Inst. Phytopath. Aschersleben.

718. DANILEJKO, A. V.
The resistance of different pea varieties to the pea weevil. [Russian.]
Agrobiologija, 1960, No. 2, pp. 306-7.

Studies over several years have shown the more resistant pea varieties to be characterized by thick foliage, medium to short stature, thick stems, large stipules, long pods on short pedicels and marrow-fat type seeds.

719. STEMERDING, S.
The influence of different rotations on a population of pea cyst eelworm, *Heterodera göttingiana* Liebscher. [German summary 9 lines.]
Nematologica, Suppl. II, Rep. 5th int. Sympos. Plant Nemat., 1959, Uppsala, 1960, pp. 97-100, bibl. 7.

From the results reported reproduction of *H. göttingiana* seems to differ widely from one pea crop to another, and pea crops on which poor reproduction occurs are fairly common. The rate of decrease in population under non-susceptible crops seems to be fairly slow. A year in which reproduction is efficient on peas may, therefore, decide the degree of infestation for several years. In this trial no good crops of peas were obtained with any of the rotations tried, even under favourable conditions of treatment and manuring, yields being never more than half those expected on an uninfested soil. [From author's conclusion.]—Plant Path. Serv., Wageningen.

720. SPENCER, E. Y., AND ROBINSON, J. R.
Metabolism of the systemic insecticide *O*, *O*-dimethyl 1-carbomethoxy-1-propen-2-yl phosphate (Phosdrin) in the pea plant.
J. agric. Food Chem., 1960, **8**: 293-5, bibl. 9.

The 2 isomers were found to degrade in the same manner but at different rates.

721. DANIELSON, C. E.
Sugar and water in ripening peas (*Pisum sativum* L.).
Physiol. Plant., 1960, **13**: 342-7, bibl 7.

The sugar concentration, calculated as a function of the water content, was not the same in the different parts of pea seeds, the highest concentration being found in the embryos and the lowest in the endosperm. During the first stage of ripening the total sugar in the embryos increased at the same rate as the water content, thus giving a constant sugar concentration in the water phase of about 8%. [See also *H.A.*, 29: 3722i and 30: 695.]—Findus Res. Lab., Bjuv, Sweden.

722. SCHUPHAN, W., AND POSTEL, W.
Samenreife und essentielle Aminosäuren bei *Pisum sativum* L. **(Seed maturity and essential amino acids in *Pisum sativum*.)**
Naturwissenschaften, 1960, **47**: 323-4, bib. 1.

s the biological value of pea seeds is of interest, the roportion of essential amino acids constituting the rude protein (= total N × 6·25) has been studied t various developmental stages. It was found at on a fresh weight basis both the dry matter and e crude protein content increased with maturity. mall green peas had a higher crude protein content as % of dry matter) than either large green peas or ully ripe peas harvested for drying. In all cases he biological value of the protein increased with aturity. The contents of 10 essential amino acids n 3 different types of pea are tabulated.—Bundes-nst. QualForsch. pflanzl. Erzeugn., Geisenheim/heingau.

723. Lewin, L. M., and Wagenknecht, A. C.
Inositol phosphatide in peas.
Nature, 1960, **188**: 146, bibl. 5.

urther data on analysis and properties. [See also H.A., 30: 3840.]

724. Stewart, J. K., and Barger, W. R.
Effects of cooling method and top-icing on the quality of peas and sweet corn.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 470-5, bibl. 4.

Tests were conducted to determine the effect of hydrocooling and vacuum cooling on the quality of garden peas that were subsequently held both with and without top-ice [a covering of crushed ice] for a simulated transit and retail period. No appreciable differences in the quality of the peas were found to result from the various methods of pre-cooling, but the use of top-ice after pre-cooling favoured the maintenance of quality. Temperature reduction by means of vacuum cooling was effective and was slightly greater for peas cooled when wet than for peas cooled when dry. [From authors' summary.] —U.S.D.A., Fresno, Calif.

Lettuce and other salad crops.

(*See also* 18, 21, 111, 134, 193, 597, 601, 681, 1111, 1656.)

725. Whitaker, T. W.
Lettuce: variety evaluation.
Amer. Veg. Gr, 1960, **8**(6): 18-19, illus.

Notes on Golden State A, B, C, and D, Merit, Lakeland, Climax, Vanguard and Valverde released by the U.S.D.A.

726. Kahn, A.
An analysis of "dark-osmotic inhibition" of germination of lettuce seeds.
Plant Physiol., 1960, **35**: 1-7, bibl. 17.

The germination of Grand Rapids lettuce seeds in darkness at 21° C. is suppressed in approximately direct proportion to the osmotic pressures (within a limited range) of solutions used. This reduction of germination by osmotica [*sic*] can be negated by irradiating the seeds with a small quantity of red light shortly after they begin to imbibe. Far-red radiation supplied after red light reverses the action of red light. Dark-osmotic inhibition delays the germination of some individuals and permanently inhibits that of others. Transferring seeds from a solution that produces osmotic inhibition to water would release a pure osmotic inhibition. However, when germination of seeds has been inhibited osmotically for 30 hours or longer, most of the seeds do not germinate after transfer to water. The secondary inhibition following primary osmotic inhibition can be released by red light and may be similar to dormancies of lettuce seeds produced by high temperature treatments. The germination of seeds that have imbibed water for 16 hours can still be affected by dark-osmotic inhibition, indicating that some early events in germination can proceed with the seeds remaining sensitive to dark-osmotic inhibition. Seeds irradiated with red light while on water show no reduction of germination when subsequently shifted onto an osmotically effective solution. Thus red light does not have to act on an established block, but can produce an effect that is "stored" and later prevents, releases or circumvents a block in germination processes. Low temperature treatment of seeds negates dark-osmotic inhibition. Puncturing seeds may also nullify dark-osmotic inhibition. It is suggested that dark-osmotic inhibition and perhaps other inhibitory treatments function solely by delaying germination, and that during the delay a process occurs which permanently prevents germination in darkness. [Author's summary.]—Univ. Calif., Los Angeles.

727. Kahn, A.
Promotion of lettuce seed germination by gibberellin.
Plant Physiol., 1960, **35**: 333-9, bibl. 16.

Gibberellin causes lettuce seeds to germinate in the dark that would not otherwise germinate, because of either a relatively low supra-optimal germination temperature, dark-osmotic inhibition, inhibition induced by a high temperature pretreatment or inhibition caused by far-red light. Thus, gibberellin is capable of replacing red light in every situation examined in which light promotes germination of lettuce seeds. Brief irradiance with far-red light, which reverses fully the potential promotion of germination by red light, does not negate gibberellin-mediated promotion of germination. Continuous far-red light delays gibberellin-mediated promotion of germination, but, under the conditions of these experiments, it did not prevent germination permanently. The promotive effects of gibberellin and red light were additive, but they were less than additive when red light was administered 4 hours after seeds had begun to imbibe on a gibberellin solution. [From author's summary.]—Univ. Calif., Los Angeles.

728. Haber, A. H., and Luippold, H. J.
Separation of mechanisms initiating cell division and cell expansion in lettuce seed germination.
Plant Physiol., 1960, **35**: 168-73, bibl. 16.

At 26° C. lettuce seed germinates rapidly and the beginnings of cell division and cell expansion roughly coincide in time. When gamma-irradiated seeds are sown on a solution of kinetin at 26° C., germination, although greatly delayed compared to that of unirradiated controls, precedes cell division by several days. Results similar to those with irradiated seeds were found with unirradiated seeds germinating at 10° C. The distribution of mitoses among root tips of newly germinated seeds at 10° C. suggested that mitoses occurred randomly among them. When seeds were germinated at 26° C. in solutions of mannitol, cell divisions preceded germination by many days. High concentrations of mannitol prevented germination of seeds that nevertheless underwent mitotic activity. At 30° C. only a very small percentage of seeds germinate. Most seeds, however, underwent cell division. The distribution of mitoses among radicle meristems of nongerminating seeds showed that mitoses were not occurring randomly among the unexpanded radicles. Rather, there was a tendency for an all-or-none characteristic in the occurrence of mitoses within individual radicles. As time progressed, the mitotic activity in these nongerminating seeds diminished. These results indicate that: A. The initiation of cell expansion and that of cell division are controlled by separate mechanisms during germination. B. Rootlet protrusion during germination results from cellular expansion, whereas cell division plays little or no role. C. The mechanisms by which kinetin and other agents stimulate lettuce seed germination are related to the initiation of cellular expansion and not to cell division. [Authors' summary.]—Oak Ridge nat. Lab., Tennessee.

729. Haber, A. H., and Luippold, H. J.
Effects of gibberellin, kinetin, thiourea, and photomorphogenic radiation on mitotic activity in dormant lettuce seed.
Plant Physiol., 1960, **35**: 486-94, bibl. 34.

The effects of the various agents on the mitotic activity in radicles of non-germinated seeds were studied under conditions near the upper temperature limits for germination. Under appropriate conditions, in which gibberellin, kinetin, thiourea and red (as compared with far-red) light could stimulate germination, only kinetin stimulated mitotic activity. Kinetin can be considered a true cell division factor in non-germinated lettuce seeds. Neither gibberellin nor red light had any significant effect on mitotic activity under conditions in which they were later active in stimulating germination. The conditions under which thiourea inhibited mitosis were the same as those under which it later stimulated germination.—Oak Ridge nat. Lab., Tennessee.

730. Haber, A. H., and White, J. D.
Action of maleic hydrazide on dormancy, cell division, and cell expansion.
Plant Physiol., 1960, **35**: 495-9, bibl. 15.

The effects were studied of germination stimulators (GA, kinetin and thiourea) used in combination with germination inhibitors (MH, coumarin, 2,4-dinitrophenol, mannitol and nicotine) on lettuce seed germination. The 3 stimulators appear to have the same effects relative to one another in relieving dormancy imposed by MH as in relieving dormancy imposed by the other 4 inhibitors. MH inhibited cell division in dormant lettuce seeds, in which cell division could otherwise occur in the absence of growth by cell expansion.—Oak Ridge nat. Lab., Tennessee.

731. Haber, A. H., and Luippold, H. J.
Action of 6-(substituted) purines on mitotic activity in "dormant" lettuce seeds.
Physiol. Plant., 1960, **13**: 298-307, bibl. 17.

At a concentration of 5×10^{-5} *M*, 6-benzylthiopurine, 6-benzylaminopurine and kinetin accelerated mitosis and cell division in radicles of non-germinated lettuce seeds. Similar concentrations of adenine or 6-mercaptopurine had no effect. However, kinetin and its analogues did not alter the relative frequencies of figures observed in the various mitotic phases or cause cytological abnormalities. The yield of radiation-induced chromosomal aberrations in seedling root tips was unaffected by sowing γ-irradiated seeds on kinetin. [From authors' summary.]—Oak Ridge nat. Lab., Tennessee.

732. Harrington, J. F.
The use of gibberellic acid to induce bolting and increase seed yield of tight-heading lettuce.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 476-9, bibl. 4.

GA sprayed at rates of 3 to 10 p.p.m. on lettuce plants at the 4- and 8-leaf stages of growth significantly increased seed yields. With these treatments the seed crop matured about 2 weeks earlier, with extremely uniform maturity among plants. GA so used can replace deheading, which costs about 4 times as much. Extremely uniform stock seed must be used, because the GA method precludes roguing for head type. GA treatment of growing plants had no effect on germination of the resulting seed or growth of the subsequent crop. [From author's discussion and summary.]—Univ. Calif., Davis.

733. Benšová, M.
Vztahy mezi množstvím závlahové vody, vlhkostí půdy, spotřebou vody, transpirací a sklizní u salátu (*Lactuca sativa* L.). **(Relations between the quantity of irrigation water, soil moisture, water consumption, transpiration and the yield in lettuce.)** [English and Russian summaries ¾ p. each.]
Rostlinná Výroba, 1960, **6**: 131-42, bibl. 11.

In the 3 lettuce varieties studied the water uptake increased throughout the growing period up to maturity, but there were varietal differences between the water uptake of irrigated and non-irrigated plants. In the non-irrigated plants the transpiration rate showed 2 daily maxima, whereas under irrigation there was a single peak at noon. There was a tendency for the transpiration rate to fall as the plants developed. Basic relationships were found between the soil moisture content, water uptake, yield and the amount of irrigation water applied. The 3 varieties differed, however, in their ability to utilize water. Thus Attraction produced relatively high yields without irrigation, whereas May King and Bohemia reacted to irrigation by proportional increases in water uptake and yield.

734. Simão, S.
Adubação da alface. **(The manuring of lettuces.)** [English summary ⅓ p.]
Rev. Agric. Piracicaba, 1960, **35**: 149-54, bibl. 5.

Lettuces grown in soil previously supplied for many years with basic amounts of mineral and organic fertilizers did not respond significantly to supplementary inorganic N, P or K or to any combination of them applied as top-dressings. There was, however, a significant yield response to watering every 5 days with sodium nitrate at 0·05–0·2%, using 10 l. of solution per 2·5 sq. m. The response was only slightly greater at 0·2% than at 0·1%.

735. Rohloff, I.
Feststellung des Salatmosaikvirus an den Samen von *Lactuca sativa* L. durch kurzfristige Sämlingsanzucht im Klimakammern. Vorläufige Mitteilung. **(The detection of lettuce mosaic virus in the seeds of *Lactuca sativa* by means of raising seedlings in climate chambers for a short period. Preliminary communication.)**
Saatgut-Wirtsch., 1960, **12**: 136, illus.

By raising seedlings under closely controlled conditions of temperature and artificial light, which are described, the symptoms of the virus became clearly visible in the 3-leaf stage within 18–24 days of sowing.—Samenprüfst. LandwKammer Westfalen-Lippe.

736. Verhoeff, K.
On the parasitism of *Bremia lactucae* Regel on lettuce. [Dutch summary 5½ pp.]
Tijdschr. PlZiekt., 1960, **66**: 133-203, bibl. 70, illus.

A study is reported on the environmental conditions affecting the development of lettuce downy mildew and on its control. Some lettuce varieties and *Lactuca* species were shown to possess a high degree of resistance to the disease and could be used as breeding material. Tests with a number of fungicides showed that downy mildew could be kept in check by preventive dusting with zineb or with B 56 (bis (dimethylthiocarbamyl ethylene bisdithiocarbamate)) at the rate of 1–1·5 g. per sq. m. The seedlings should be dusted every 5–6 days until 3–4 weeks after transplanting; later infections cause little damage.—Proefst. Groent. Fruitt. Glas, Naaldwijk.

737. Schnathorst, W. C.
Relation of microclimates to the development of powdery mildew of lettuce.
Phytopathology, 1960, **50**: 450-4, bibl. 22.

Gradients in temperature and R.H. within the sphere of lettuce plants in the field appeared to be too small to account for gradients in mildew infection on the same plants. It is therefore concluded that the disease caused by *Erysiphe cichoracearum* is mainly influenced by the macroclimate.—Univ. Calif., Davis.

738. Plumier, W.
Biologie floral et fécondation. **(Flower biology and fertilization [in chicory].)**
Ann. Gembloux, 1960, **66**: 151-6, illus.

The absence of segregation in progeny noted indicates a marked degree of apogamy.

739. Gagne, J. B.
L'étude des variétés. **(The study of [chicory] varieties.)**
Ann. Gembloux, 1960, **66**: 100-10.

Problems and the need for such studies.

740. Tilkin, V. E.
La multiplication par voie végétative. **(Vegetative propagation [of witloof chicory]).**
Ann. Gembloux, 1960, **66**:93-9, illus.

It is suggested that vegetative propagation affords a simple method of providing desirable strains of chicory in adequate amounts. Trials to date lead to the recommendation of the following procedure: In mid-winter, December to January, the roots are cut into horizontal sections about 1·5 cm. thick and the sections are set in sandy soil in containers at a glasshouse temperature of 18–20° C. Generally speaking one root will provide 12 such sections. Three weeks later the numerous shoots which will have formed are removed and set in a layer of sand 3 to 4 cm. deep warmed by a cable to maintain a temperature of 25° C. This combined with an air temperature of 15° C. should ensure a 75% strike. About a fortnight later, when the cuttings will have made their first roots, they are set out in propagation frames at a temperature of 16–20° C. As from the beginning of March either the plants are retained in their vegetative stage by keeping them at about 15–18° C. till planting out in the open during the second half of May or, if it is wished to bring them into the generative stage, they are put in a frame having a rather lower temperature, viz. 8–10° C. Two or three weeks later they are gradually acclimatized to outside conditions and finally, in April, they are planted out at a normal spacing of 1·0 × 0·5 m. This practice should be of great value in the production of improved strains of chicory.

741. DOORENBOS, J., AND RIEMENS, P. C.
Effect of vernalization and day length on number and shape of leaves in chicory and endive.
Acta bot. neerl., 1959, **8**: 63-7, bibl. 2.

Both chicory and endive plants which had been subjected to seed vernalization and long days produced fewer leaves per unit of time than control plants, and their fresh weights were also lower. The after-effects of low temperature on leaf morphology of chicory were confirmed [see *H.A.*, 27: 2489]; leaves of vernalized endive plants were longer, broader and thinner than those of unvernalized plants.—Lab. Tuinbouwpl., Wageningen.

742. JACOBS, A.
Problèmes techniques de forçage. (**Technical problems in [the] forcing [of chicory].**)
Ann. Gembloux, 1960, **66**: 139-50, illus.

A description of different methods and apparatus used to provide heat for forcing chicory, based on (1) fermentation of flax waste, (2) hot air circulation, (3) hot water circulation and (4) electric cables.

743. HUYSKES, J. A.
Le forçage en relation avec le cycle de végétation. (**Forcing [chicory] in relation to the growth cycle.**)
Ann. Gembloux, 1960, **66**: 121-38, bibl. 6, illus.

Dutch procedure used when forcing well-known chicory varieties is briefly noted. Successful forcing depends on the roots having been partially vernalized. Vernalization trials on the varieties Hâtive de Malines and Kampenhout are described. They show that the effects of cold on roots which are to be forced include increases in quality, length of axis, weight and yield and length of period in which forcing is possible. The growth of the axis really marks the passing of the plant from the vegetative to the reproductive stage. This change is induced by vernalization. Parallel with this well-known physiological process is an increasing aptitude of the roots for forcing. Both adequate and excessive vernalization must be avoided, and the required amount will vary from variety to variety. Particular instances of this are cited and illustrated.

744. ANSIAUX, J. R., AND CAMBIER, M.
Le problème de la fumure de la chicorée-witloof. (**The problem of manuring witloof chicory.**)
Ann. Gembloux, 1960, **66**: 111-20, bibl. 10, illus.

The only definite conclusion drawn from a consideration of normal commercial practice and trials carried out during 1957–1959 with other formulae is that recommendations can only be made for normal years and not for such abnormal years as 1959. Commercial practice, in which a 4 : 8 : 15 formula is used, ensures the following amounts being given per ha:—N 20 kg., P_2O_5 40 kg., K_2O 75 kg., CaO 100 kg. and MgO 17 kg. In the trials noted here only small differences in yield resulted when the above formula was altered drastically.

745. MARRAS, F.
Prove di lotta contro la ruggine delle indivie (*Puccinia cichorii* (DC.) Bell.) (**Control of endive rust (*Puccinia cichorii*).**) [English summary 6 lines.]
Not. Mal. Piante, 1960, No. 52, pp. 137-46, bibl. 9, illus.

In work at Sassari colloidal sulphur was ineffective against endive rust, but dithiocarbamates, and especially zineb when mixed with Karathane, gave considerable control.

746. TOMLINSON, J. A.
Crook-root disease of watercress. A review of research.
N.A.A.S. quart. Rev., 1960, **12**: 13-19, bibl. 9, illus.

Including current work on control with zinc frit and zinc sulphate [see also *H.A.*, 29: 2542].

Mushrooms.

747. MINISTRY OF AGRICULTURE, LONDON.
Mushroom growing.
Bull. Minist. Agric. Lond. **34**, revised 1960, pp. 65, illus., 6s.

This is the 7th edition of this bulletin, and it includes much additional and recent information on developments since the 6th edition was published 6 years ago. This is particularly true of the section on pests and diseases, which has been rewritten. The whole bulletin is very well illustrated.

748. MORISHITA, F. S.
Fly control on a mushroom farm in southern California.
Calif. Agric., 1960, **14**(5): 9, illus.

Combined cultural, mechanical and chemical methods of controlling phorid and sciarid flies included the cementing and periodic sweeping of the working area and spraying of surrounding areas with dieldrin. After filling the benches the houses were tightly closed and the compost was steam-pasteurized. Doors and frames were painted with diazinon slurry (while the houses were being cooled), the inside and outside walls were sprayed with diazinon (6 lb. 25% w.p./25 gal.) and the attics were dusted with diazinon 2½% dust. Treatments were repeated every 10–14 day. Treatment of the compost with insecticides either inhibited mycelial growth or produced a few huge mushrooms.—Univ. Calif., Los Angeles.

749. IWAMURA, M.
Injurious insects of the Japanese pine mushroom. VIII. The economic effects of insecticide applications. [Japanese, with English summary ½ p.]
Sci. Reps Fac. Agric. Okayama Univ., 1960, No. 15, pp. 19-26, bibl. 5.

The application of various chlorinated hydrocarbons for the control of dipterous larvae in *Armillaria matsutakei* reduced infestation by more than 50% and increased the crop to over 50 kg./ha.

Okra.

(*See also* 18.)

750. JOSHI, A. B., SINGH, H. B., AND JOSHI, B. S.
Why not grow Pusa Sawani.
Indian Fmg, 1960, **10**(1): 6-7, illus.

A new okra variety, resistant to yellow-vein-mosaic.

751. MARTIN, J. A., AND OTHERS.
Response of okra seed to moisture content and storage temperature.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 490-4, bibl. 5, illus.

A high moisture content in Clemson Spineless okra seed was detrimental to seed viability and germination and encouraged growth of *Botrytis* spp. at room temperature (70–100° F.) and *Penicillium* spp. at both room and cold storage temperatures (35–40° F.). At the 2 highest seed moisture levels (25 and 19%) there was no germination after 1 year's storage at room temperature and after 5 years of cold storage. Reducing the moisture content retarded deterioration. Cold storage of seeds with a low moisture content (12% or less) maintained a germination capacity of 90% for a period of 11 years. Even for a short storage period it was found that the seed should be dried to 13·6% moisture or less. High O_2 and low CO_2 levels in the containers resulted in poor germination of seeds with high moisture levels, whereas high CO_2 and low O_2 levels tended to maintain seed viability.—Clemson Coll., S.C.

Onions and related crops.

(*See also* 18, 601, 689, 948.)

752. MONTILLA, J. A., AND CHICCO R., J.
Variedades de la cebolla. (**Onion varieties.**)
Ing. agron., 1959, No. 3, pp. 21-5, bibl. 16, illus.

The early hybrid Yellow Granex is recommended for Venezuela, following variety trials that are described here in some detail.

753. KISS, F., AND SÁGI, F.
Összehasonlító vizsgálatok különböző hagymafajták termésértékére vonatkozólag. (**Comparative studies on the yielding capacity of different onion varieties.**) [Russian and German summaries ½ p. each.]
Kísérl. Közl., Sect. C, 1959 (issued 1960), **52C**(3): 41-52, bibl. 13, illus.

Most of the 18 onion varieties investigated produced higher yields in 1-year cultivation from seed than in 2-year cultivation from sets. Late autumn (early December) or early spring sowing gave better results than early autumn or delayed spring sowing. Yield and dry matter content were higher on organic than on mineral soils. The varieties Hegyköi, Makói and Vertus were distinguished by high sugar and dry matter contents. The relationship between high dry matter content and storage quality was confirmed. Under ordinary storage conditions May and June were the critical months, and no variety could be stored beyond July. Seed plants gave the highest seed yields from December planting and the lowest from April planting. Most of the varieties produced viable seeds when self-pollinated.

754. LACHMAN, W. H., AND MICHELSON, L. F.
Effects of warm storage on the bolting of onions grown from sets.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 495-9, bibl. 15.

The bolting, which is normally expected during the development of onion plants when grown from sets, was eliminated, or practically so, by storing the sets in a warm, dry atmosphere at a temperature of 86° F. for periods of 8 to 17 weeks [see also *H.A.*, 25: 605]. The splitting of bulbs, which often accompanies bolting, was not affected by the storage treatments. Depending on the year and size of the sets, a considerable loss in weight of sets was incurred as a result of warm storage. The treated sets did not differ consistently in yield from untreated sets. [Authors' summary.]—Mass. agric. Exp. Stat., Amherst.

755. ANG, J. K., ISENBERG, F. M., AND HARTMAN, J. D.
Measurement of firmness of onion bulbs with a shear press and a potentiometric recorder.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 500-9, bibl. 5, illus.

The L.E.E.-Kramer shear press, with modifications, was used to determine bulb firmness. Onion bulbs were compressed by a flat plunger that travelled at a constant speed. Amount of compression (D) and force (F) were recorded. The ratio of F to D was used to express the bulb firmness. It was found that F/D values were proportionally increased with size of onion (diameter). Correction factors calculated from an empirical formula were used for compensating for difference in size. Three varieties of yellow onions were tested. Super Bronze and Gillard's hybrid were consistently harder than Early Yellow Globe. Planting-out tests showed that subjecting bulbs to compression force until they broke did not impair their seed producing ability. This could be a useful tool for onion breeders for the selection of firm bulbs. [From authors' summary.]—Cornell Univ., Ithaca, N.Y.

756. BURIĆ, S., AND BLAGOJEVIĆ, M.
Prilog ispitivanju mogućnosti suzbijanja gari luka (Arpadžika). **(A contribution to the study of the possibility of onion smut control.)** [French summary 1 p.]
Zasht. Bilja, 1959, No. 54, pp. 77-86, bibl. 5.

The only method found effective for the control of *Urocystis cepulae*, viz. total disinfection of the soil with formalin or thiram, is considered impracticable on account of the large amounts of water and fungicide needed. Disinfection of the seed before sowing was generally not satisfactory, and some of the compounds used proved phytotoxic at the concentrations required. Seed disinfection with thiram powder, however, was promising.

757. KLEIJBURG, P.
Soil sample examination as a basis for advisory work against stem eelworms, *Ditylenchus dipsaci* (Kühn). [German summary 15 lines.]
Nematologica, Suppl. II, Rep. 5th int. Sympos. Plant Nemat., 1959, Uppsala, 1960, pp. 22-7, bibl. 2, illus.

In onions.

758. MANN, L. K.
Nematode-free garlic planting stock.
Calif. Agric., 1960, **14**(5): 7.

Now available after lengthy selection.

759. STATENS FORSOGSVIRKSOMHED I PLANTEKULTUR.
Forsøg med stammer af skalotteløg 1956-1958. **(Shallot strain trials, 1956-1958.)**
Tidsskr. Planteavl, 1960, **64**: 171-4.

Eleven strains compared in 3 areas.

Rhubarb.

(*See also* 969.)

760. SMITH, F. G.
Effects of weather on the subsequent forcing of rhubarb.
Progr. Rep. exp. Husb. Fms and exp. Hort. Stats 1960, pp. 25-7, illus.

Rhubarb roots could not be satisfactorily forced unless they had an adequate period of low temperature before lifting. By relating the yields of forced rhubarb to various pre-cooling treatments, it was possible to calculate that the roots respond to accumulated temperatures below about 49° F. A method of calculating cold units is described.—Stockbridge House, Selby, Yorks.

761. COOK, J. A.
Quality deterioration of forced rhubarb during handling and marketing.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **42**: 878-85.

Of the factors studied the application of low temperatures proved most beneficial in retaining quality, and a temperature of 32° F. was better than 40° and higher. Carton size and ventilation had no effect. Moisture losses were reduced by applying wax to the leaves and protecting the packed rhubarb from water uptake by the carton. Waxes proved unsatisfactory because of injury to the leaves. Cartons made of wax-impregnated paper and the placing of a moisture barrier of polythene around the rhubarb within the carton aided crispness retention without damage to the crop. Captan applied to leaf blades by post-harvest dips reduced losses due to leaf rot at holding temperatures of 55°, but not at 40° F. [From author's summary.]

Root crops.

(*See also* 78, 94, 193, 389, 593, 597, 646, 1656, 1665.)

762. KELLY, J. F.
Boron utilization by red beets.
Diss. Abstr., 1960, **20**: 3915-16, being *L.C. Card No. Mic.* 60-1005 of 110 pp.

Broad differences in seedling vigour may be responsible for differences in the response of seedling and mature beets to low B levels. However, differences in the B content of seeds did not produce differences in seedling growth in B-deficient media. B deficiency did not affect the cation content of leaf tissue within a variety or strain. Varieties and strains least tolerant to low B levels tended to accumulate the largest amounts of Ca in young leaf tissue, and high Ca levels appeared to result in increased B deficiency. Significant differences in the Mg concentration in young leaf tissue were found between varieties. At least 2 types of tolerance to low B levels were evident, one in plants with low Ca and Mg levels, and the other in plants with high Ca and Mg levels.—Univ. Wis.

763. SHALLENBERGER, R. S., AND SAYRE, C. B.
The effect of fertilizer treatments on the pyrrolidonecarboxylic acid content of processed beets.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 445-8, bibl. 5.

Off-flavour in processed beets is caused partly by pyrrolidonecarboxylic acid (PCA), formed during processing from its precursor glutamine. Experiments to compare the effects of ammonium or nitrate fertilizer on the concentration of PCA in processed beet showed that the N source had no effect on PCA formation. When beets were frozen during the storage period prior to processing, however, the glutamine content, and consequently the PCA content, were markedly increased.—Cornell Univ., Geneva, N.Y.

764. Carlson, E. C.
Effects of the green peach and bean aphids on table beet seed plants.
Calif. Agric., 1960, **14**(10): 11-12, illus.

The seed yield was significantly reduced in plants having moderate, as well as severe, infestations of *Myzus persicae* and *Aphis fabae*, and infested plants produced more small and shrivelled seeds of lower viability than plants free of aphids. Studies made on the population ratios of aphids to ladybird beetles, *Hippodamia* spp., indicated that, to be effective, the ratio of beetles to aphids should be high when the plants begin to bolt in April.—Univ. Calif., Davis.

765. Dickson, M. H., and Peterson, C. E.
The influence of gibberellin on the flowering of carrots.
Canad. J. Plant Sci., 1960, **40**: 468-73, bibl. 9, illus.

When aqueous GA was applied at 100 and 1,000 p.p.m. to carrots 5 or 6 times, beginning when 6–8 leaves had been initiated, earlier flowering and a higher percentage of flowering plants resulted. Fewer or more treatments at later stages of development resulted in slower and later responses. Following a warm spring GA might be used as an aid in the selection of non-bolting genetic lines in a carrot-breeding programme, as plant populations with a bolting tendency responded much more vigorously than those which are characteristically non-bolting. [From authors' abstract.]—Mich. St. Univ., E. Lansing.

766. Eršova, N. K.
The productivity of photosynthesis in autumn and spring sown carrots. [Russian.]
Fiziol. Rast., 1960, **7**: 104-6.

Carrots sown at the end of October or early November showed a greater dry matter increment per unit of leaf area and a higher chlorophyll content, and matured 20–30 days earlier, than carrots sown in April.

767. Kohashi S., J.
El uso de herbicidas selectivos en la zanahoria. **(The use of selective herbicides in carrots.)**
From summary in *Proc. Carib. Reg. Amer. Soc. hort. Sci.*, *1957*, 1958, **5**: 61.

As regards efficiency and cost, petroleum oil and naphtha herbicides compared favourably with hand weeding.

768. Guzman M., E.
Uso de herbicidas en los cultivos de zanahoria y chícharo en el Valle de Toluca, Méx. **(The use of herbicides in carrot and pea crops in the Valle de Toluca, Mexico.)**
Agric. téc. Méx., Winter 1959-1960, No. 9, p. 15.

Equally good weed control in carrot crops at the 2-leaf stage was given by a mixture of 2 l. of CIPC with 800 l. of naphtha per ha. and by 0·25 kg. of CMU per ha., but the mixture was nearly 23 times as costly as the CMU at these rates. Both were superior to PDU. The pea crops [age not stated] were damaged by MCP amine and CMU, but good results followed pre-emergence application of 1 l. of CIPC mixed with 3 l. of dinitro.—Campo exp. Santa Elena.

769. Anon.
New chemical promising for carrot root fly control.
Grower, 1960, **54**: 704.

For controlling carrot fly on celery an unspecified material called New Drench B has shown promising results equal to those obtained with aldrin. Dipping and root dusting at transplanting with aldrin were both followed by a growth check.—N.A.A.S., Lancs.

770. Mosebach, E., and Steiner, P.
Arbeiten über Rückstände von Pflanzenschutzmitteln auf oder in Erntegut. VI. Biologischer Nachweis von Diazinon-Parathion-Rückständen bei Radieschen und Möhren. **(Residues of plant protection substances in or on crops. VI. Biological determination of diazinon and parathion residues in radishes and carrots.)** [English summary ¼ p.]
NachrBl. dtsch. PflSchDienst., Braunschweig, 1960, **12**: 129-33, bibl. 8.

Drosophila tests were made on macerated material in the very dry summer of 1959. Diazinon and parathion were found to penetrate the cortex and they could not therefore be eliminated by removal of the cortex. Carrots take up these residues during growth, and the highest contents are found some 14 days after treatment. Flavour in radishes was not spoiled by residues of 6 p.p.m. of diazinon or 2 p.p.m. of parathion. Carrots containing up to 3 p.p.m. of parathion residue tasted the same as untreated carrots, but a 0·6 p.p.m. diazinon residue caused an off-flavour. [For part V, see *H.A.*, 30: 736.]—Biol. Bundesanst., Braunschweig.

771. Warzecha, A.
Zawartość błonnika i kwasu askorbinowego w rzodkiewce (*Raphanus sativus* v. *radicola*) oraz jego straty w zależności od warunków przechowania. **(The cellulose and ascorbic acid contents of radish (*Raphanus sativus* v. *radicola*) and the effect of storage conditions thereon.)** [Russian and English summaries ½ p. each.]
Zesz. Nauk. Szczecin, 1960, No. 3, pp. 91-6, bibl. 4.

The radish variety "Icicle" had a higher vitamin C content than "Round Scarlet White-Pointed."

Losses of vitamin C during 3 hours' storage were least in roots held at 1° C. and greatest in roots kept at a room temperature of 20° C. Treatment with salt reduced these losses.

Spinach.

(*See also* 111).

772. SCHMIDT, L.
Effect of sodium on spinach and tomato. [German?]
Flora, 1959, **148**: 1-22, from abstr. in *J. Sci. Food Agric.*, 1960, **11**: ii-110.

In water-cultured spinach and tomato assimilation of CO_2 increased with a rise in the K content of the nutrient. Respiration was highest with low K supplies and declined as the supply increased. When the K supply was partially replaced by an equivalent amount of Na the green weight of spinach diminished as the Na supply increased; tomato was only affected by relatively large proportions of Na. Assimilation of CO_2 per unit leaf area in spinach increased with the level of Na supplied, but in tomato only the complete replacement of K by Na caused such an increase. Respiration rates in both plants were slightly lowered by low levels, but increased by higher levels, of Na supply.

773. KAYS, W. R., AND GALEOTTI, C.
Studies of chemical weed control in spinach.
Processed Ser. Okla. agric. Exp. Stat. **P-330**, 1959, pp. 7.

CDEC at 3 lb./acre and EPTC at 2 lb/acre gave acceptable control of broadleaved and grass weeds and significantly increased the yield of spinach compared with the unweeded control.—From *Weed Abstr.*, **9**, No. 1571.

774. IWAMURA, I., AND OTHERS.
Studies on the isolation and nature of ribonucleic acid from spinach leaves. 1. Isolation of ribonucleic acid from spinach leaves and the method for determining its purity. [English summary ⅓ p.]
Bull. Fac. Agric. Univ. Miyazaki, 1960, **5**: 151-6, bibl. 9.

Identification and comparison with RNA from brewers' yeast.

775. BECKER, R. F., GOODMAN, R. N., AND GOLDBERG, H. S.
Factors affecting decay of prepackaged spinach.
Food Technol., 1960, **14**: 127-30, bibl. 14, from abstr. in *J. Sci. Food Agric.*, 1960, **11**: ii-76-7.

The rate of decay appeared to depend on the bacterial population of the spinach and on leaf N-content. Antibiotics in low concentrations would be effective in reducing decay especially in warm weather.

Sweet and red peppers and eggplants.

(*See also* 18, 188, 597, 670, 793.)

776. POSGAY, E.
Vetésidő-, tenyészterület és feltöltési kísérletek szántóföldi magvetéssel termesztett fűszerpaprikával. (**Further studies on red pepper production by direct sowing.**) [English and Russian summaries ¾ p. each.]
Növénytermelés, 1960, **9**: 97-112, bibl. 4, illus.

Vernalized seeds of red pepper were sown at 4 kg. per cadastral hold [=1·42 acres] by the method described earlier [see *H.A.*, 30: 750]. The best time for sowing was the end of April, when the soil temperature at a depth of 5 cm. reached 15·5° C. The seedlings were thinned out at the 4–6-leaf stage, leaving 4–5 plants in groups 40 cm. apart in rows 60 cm. apart. By this method, tested over 5 years, higher yields were obtained than by transplanting seedlings raised in cold frames, and as good yields or better than were produced by seedlings raised in hot frames. Production costs of the direct sown crop were much lower. The method was found to be best suited to grassland and meadow soils. There was little danger from late frost as the seedlings in the cotyledonary stage withstood −4° C. without injury.

777. OZAKI, H. Y.
Effects of ammonium nitrate and sulfate of potash on recovery of cold-injured pepper plants.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 521-4, bibl. 4, illus.

In a fertilizer trial with Florida Giant capsicums frosts in December and February injured the fruits and killed the exposed foliage and the tips of the young stems. The differential N and K treatments were continued. The plants recovered and produced a high yield of marketable fruit in April from a second crop produced on new growth. Fortnightly applications of ammonium nitrate at the rate of 30 lb. N per acre resulted in higher second-crop yields than rates of either 20 or 40 lb.; this response to N was similar to that for normal plants harvested in the spring [see *H.A.*, 26: 2859]. Fortnightly applications of sulphate of potash at the highest rate (40 lb. K_2O per acre) were required to produce the highest yields; this was higher than the rate required for normal plants [see *H.A.*, 29: 1553b], possibly owing to conditions favouring heavy leaching.—Plantation Field Lab., Fort Lauderdale, Fla.

778. COOK, A. A.
Virus disease resistance in peppers.
Proc. Fla St. hort. Soc., *1959*, 1960, **72**: 110-12, bibl. 18.

An outline of a breeding programme in which two bell peppers (*Capsicum annuum*), P11 and P34, resistant to tobacco mosaic, tobacco etch and potato Y viruses, are being used.

779. SIMONS, J. N.
Effects of foliar sprays of Cytovirin on susceptibility to and transmissibility of potato virus Y in pepper.
Phytopathology, 1960, **50**: 109-11, bibl. 4

Cytovirin, applied in the greenhouse as a foliar spray to Californian Wonder pepper plants, reduced susceptibility to infection by potato virus Y, but only at doses which were phytotoxic.—Fla agric. Exp. Stats.

780. PALOTÁS, J., AND KONECSNI, I.
Paprikaőrlemény szín, pirosszínérték és festéktartalom mérési kísérletek. (**Trials on measuring the colour, red colour values and pigment content in ground red pepper.**) [Russian and German summaries 1 p. each.]
Kísérl. Közlem., Sect. C, 1959 (issued 1960), **52C**(3): 53-72, bibl. 8.

It was found that, in general, the pigment content paralleled colour. Data are given on the pigment content of 6 grades of pepper, both freshly processed and after 12 months' storage.

781. BENEDEK, L.
A fűszerpaprika kapszaicintartalmának meghatározása. (**Determination of the capsaicin content in spice paprika.**) [English and Russian summaries 1 p. each.]
Kísérl. Közlem., Sect. C, 1959 (issued 1960), **52C**(3): 33-9, bibl. 5.

Colorimetrically, using the greenish-blue colour reaction with vanadium oxychloride.

782. SAMY, T. S. A., KAMAT, V. N., AND PANDYA, H. G.
Capsaicin contents of chilli varieties.
Curr. Sci., 1960, **29**: 271, bibl. 1.

Varied from 7·5 to 29·4 mg./100 g. according to variety and decreased during ripening and drying.

783. MCKEEN, C. D., AND MOUNTAIN, W. B.
Synergism between *Pratylenchus penetrans* (Cobb) and *Verticillium albo-atrum* R. and B. in eggplant wilt.
Canad. J. Bot., 1960, **38**: 789-94, bibl. 16.

Studies conducted in steam-sterilized soil inoculated with both organisms showed the existence of a synergistic relationship between the fungus and the nematode. At low and intermediate levels of *Verticillium* inoculum the nematode increased wilt, and the increase may be a function of the number of nematodes present. Except at the high inoculum levels of *Verticillium*, significantly greater numbers of *P. penetrans* occurred in eggplant roots in the presence than in the absence of the fungus. The nematode alone had no adverse effect on root condition or growth of the eggplant. [From authors' abstract.]—Canada Dep. Agric., Harrow, Ont.

Tomatoes—general.

(*See also* 18, 155.)

784. CARNCROSS, J. W. (Editor).
American tomato yearbook, 1960.
C. Stedman Macfarland, Jr., 8 Elm St., Westfield, New Jersey, 1960, pp. 43, sub. price $2.

Within its covers this booklet provides a great deal of concise information for anyone in the U.S. or Canada concerned with the growing, marketing or processing of tomatoes. The contents include a list of associations concerned with improvement of the tomato industry; the grade requirements for canning and processing; bibliographies of recent literature; lists of experiment stations and individuals engaged in research; statistics of yield, etc.; and a buyer's guide.

785. WISHART, R. L., AND ROGERS, I. S.
Tomatoes as a market crop.
J. Agric. S. Aust., 1960, **63**: 266-70, 356-9, 455-60, illus.

This is a revision of a departmental pamphlet on commercial tomato growing and deals with outdoor tomatoes and tomatoes under glass. All aspects of growing the crop, including the choice of varieties, are covered.

786. MARTIN, P.
La tomate de serres. Les façons culturales. (**Greenhouse tomatoes. Cultural practices.**)
Rev. d'Oka, 1960, **34**: 51-3.

Brief notes on fertilization, watering, mulching, pruning, support and pollination in Quebec. [For introductory notes, see *H.A.*, 30: 2310.]

787. ZOETEMAN, H., AND NOORDERMEER, J.
Late tomaten in het Rijkstuinbouwconsulentschap Geldermalsen. Een praktijkonderzoek naar de mogelijkheden tot verbetering van de teelt. (**Late tomatoes in the Geldermalsen advisory district. A practical study on the possibilities of improving the crop.**) [English summary 9 lines.]
Meded. Dir. Tuinb., 1960, **23**: 389-96.

Glasshouse tomatoes following early strawberries have shown a decline in quality in this area. From the results of a study of the factors responsible growers are advised to: (1) improve soil structure by incorporating a compost/peat dust mixture; (2) provide adequate water with the aid of tensiometer readings; and (3) correct Mg deficiency by low volume applications of urea plus magnesium sulphate.

Tomatoes—breeding and varieties.

(*See also* 1677.)

788. Michálek, K.
Vyšlechtění keříčkovitého typu rajčete s vyšší raností, produkcí sušiny a s částečnou odolností proti poléhaní. (**Breeding bush tomatoes with increased earliness, dry matter content and partial resistance to lodging.**) [Russian and German summaries 9 lines each.]
Acta Univ. Agric., Brno, Ser. A, 1959, Special No., pp. 117-22, bibl. 5, illus.

789. Prashar, D. P.
Inheritance of fruit cracking in tomatoes.
Diss. Abstr., 1960, **21**: 4, being *L.C. Card No. Mic.* 60-2098 of 98 pp.

A study of the progeny of crosses from 2 resistant and 2 susceptible varieties showed that cracking was dominant, though dominance was incomplete. —Univ. Missouri.

790. Young, H. W.
Inheritance of radial fruit cracking in a tomato cross.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 207-10, bibl. 2.

Radial cracking is determined by 2 major gene pairs, and resistance to it is associated with pink fruit colour, high number of fruits per plant, low average number of locules per fruit, small fruit size and determinate plant growth habit.—North Fla Exp. Stat., Quincy.

791. Wallace, M. E.
A possible case of affinity in tomatoes.
Heredity, 1960, **14**: 275-83, bibl. 17.

Evidence for this new genetic phenomenon, hitherto confined to mice, in tomatoes.

792. Lambeth, V. N.
Origin and performance of Tuckcross Forcing tomatoes.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 570-3, bibl. 5.

The performance of F_1 hybrids of the disease-resistant Tuckers Forcing with commercial forcing varieties.

793. Scott, F. H., and Johnson, L. W.
1959 progress report. Variety trials—tomato, sweet potato, pepper.
Res. Rep. Va agric. Exp. Stat. **34**, 1960, pp. 33.

Climatological data, tabulated yields, fruit analysis and notes on varieties.

794. Stall, R. E., and Walter, J. M.
Contamination of the tomato variety Manalucie during its first five years.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 151-3, bibl. 1.

By cross-pollination, resulting in plants susceptible to grey leaf spot (*Stemphylium solani*) in commercial crops.

Tomatoes—seedling production and planting.

(*See also* 168, 194.)

795. Walkof, C.
An improved method of tomato transplant production for the northern plains.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 579-83, bibl. 2, illus.

The Morden system of tomato plant production, developed for use in areas with a short growing season, consists of raising the seedlings in a greenhouse or cold frame for 4 weeks only without pricking out; the seeds are sown, at a rate of 10 per sq. in., on 15 April and the seedlings planted out in the field under plant protectors, such as Hotkaps, when they are only 3–5 inches high. In a 5–year test variations of the Morden system were compared with the conventional method of sowing in the greenhouse on 15 April, pricking out on 30 April and transplanting to the field without protectors a month later when the plants were 8 in. tall and had developed flower buds. Total yields from 3 varieties were 51% higher with the Morden system than with the conventional method, and allowed 40 times more plants to be produced from a given greenhouse space. A later test showed that even greater yields and a higher percentage of marketable fruit can be obtained from the Morden system if the seed is sown earlier on 1 April.—Exp. Fm, Morden, Man.

796. Takahashi, K., Yoshida, M., and Hirao, R.
Studies on composts for raising seedlings of vegetable crops in hot beds. I. Rapidly made compost for raising tomato seedlings. [Japanese, with English summary ⅔ p.]
J. hort. Ass. Japan, 1960, **29**: 27-36, bibl. 4.

Volcanic ash soil proved superior to either clay loam or sand for the mineral fraction of the compost, and leaf mould from broadleaved trees was superior to rice straw or peat moss for the organic portion. The best results were obtained with a 1:1 mixture by volume. Sieving the organic material or adding soil conditioners or sand had no effect. The use of soya bean, rape seed and fish oil cakes, rice bran and calcium cyanamide was injurious to the plants, the best form of N being ammonium sulphate or urea. Injury resulted from N dosages above 70–140 g. per cu. m. The best rates of P and K were 700 g. P_2O_5 and 70-140 g. K_2O per cu. m., respectively.

797. Körös, L.
Adatok a korai paradicsomtermesztés agrotechnikájához. (**Data on cultural practices in early tomato growing.**) [English and Russian summaries 1 p. each.]
Kisérl. Közlem., Sect. C, 1959, **52C**(2): 39-52, bibl. 23.

wo tomato varieties were used, namely Kecs- eméti Törpe, a dwarf, determinate type, and ecskeméti 42, a larger, semi-determinate type. he seeds were sown on 4 different dates in boxes the glasshouse, pricked out into warm beds and anted out either before the end or after the end of te frosts. Planting out after the danger of late osts reduced yields by an average of 38% com- ared with plants sown on the same date and planted ut 10–14 days earlier. The optimum times for owing were the end of February-early March, and r planting out the end of April-early May. The ptimum spacing for both varieties was 30×40 cm., which spacing, however, mechanical cultivation is npracticable. Under field conditions double rows 70×30×30 cm. or single rows of 70×20 cm. are commended for the dwarf type and a spacing of 0 × 30 cm. or 70 × 40 cm. for the larger type.

Tomatoes—soil management, nutrition and irrigation.

(*See also* 30, 35, 38, 146, 602, 603, 815, 816, 1645, 1665, 1677.)

798. HUGHES, M. B.
The effect of subsoiling on the yield of several tomato varieties and its relation to soil fumigation.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 595-600, bibl. 4.

n soils consisting of a sandy, shallow surface layer verlying a water-retentive but root-impervious ubsoil, subsoiling gave greater tomato yield creases than did row fumigation with Dowfume -40. Combining subsoiling with row fumigation id not give additive results, because their effects ppeared to be duplicative rather than complemen- ry. Both treatments resulted in an increase in the olume of healthy absorbing roots and a decrease the water deficit in the plants during drought eriods. Subsoiling is therefore preferable to umigation, on account of its simplicity, its greater ffect on yield and its lower cost, except in the event f a nematode build-up in the subsoil.—Clemson disto Exp. Stat., Blackville, S.C.

799. BURGIS, D. S.
Herbicides for tomatoes and pole beans.
Proc. Fla agric. Exp. Stat., 1959, 1960, **72**: 190-3, bibl. 6, illus.

s a result of earlier experiments [*H.A.*, 28: 2499] nd those reported here, Eptam [EPTC] is recom- ended for weed control in pole beans, and Eptam r Karmex DW in established tomatoes.—Gulf oast Exp. Stat., Bradenton.

800. SUND, K. A., PUTALA, E. C., AND LITTLE, H. N.
Reduction of 3-amino-1,2,4-triazole phytotoxicity in tomato plants.
J. agric. Food Chem., 1960, **8**: 210-12, bibl. 19, illus.

When the concentration of 3-AT was $1 \times 10^{-4}M$, equimolar solutions of certain purine precursors simultaneously applied caused a reduction of 3-AT growth inhibition; but this did not occur when all concentrations were five times this amount. Adenine, hypoxanthine and guanine and their ribosides acted like the purine precursors. Riboflavin, flavin mononucleotide and flavin adenine dinucleotide reduced not only 3-AT growth inhibition at $5 \times 10^{-4}M$, but also the inhibition of chlorophyll formation. A hypothesis of the mechanism of 3-AT phytotoxicity is presented. [From authors' abstract.]—Univ. Mass., Amherst.

801. WILCOX, G. E., AND LANGSTON, R.
Effect of starter fertilization on early growth and nutrition of direct-seeded and transplanted tomatoes.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 584-94, bibl. 8.

For direct-seeded tomatoes P was the element that resulted in the most growth response, whereas transplanted tomatoes responded most to N, followed by P. The total P uptake by the direct-seeded tomatoes was directly related to the rate of P application in the fertilizer band, whereas for transplanted tomatoes the total P uptake was directly related to both the N and P rates in the fertilizer band. The uptake of P derived from the fertilizer was of the same magnitude for both direct-seeded and transplanted tomatoes and was related directly to the rate of application. The composition of the fertilizer band had a much greater effect on the composition of the direct-seeded tomatoes than on that of the transplanted tomatoes. The over-all effect of K in the fertilizer band was to depress the growth of direct-seeded tomatoes, but it had little effect on the transplants. [From authors' summary.]—Purdue Univ., Lafayette, Ind.

802. VAKLINOVA, S., ŠTYRBANOVA, E., AND TOMOVA, N.
Nitrate and ammonia nitrogen in the production of certain amino acids during photosynthesis. [Russian, with English summary 6 lines.]
C. R. Acad. bulg. Sci., 1960, **13**: 339-42, bibl. 11, illus.

Ammonia N introduced into tomato leaves *via* the stems was metabolized mainly into glutamine and asparagine, whereas nitrate N was used for the aminization of oxalo-acetic, α-ketoglutaric and pyruvic acids with the subsequent formation of asparagic acid, glutamic acid and α-alamine.

803. LOCASCIO, S. J., AND WARREN, G. F.
Interaction of soil temperature and phosphorus on growth of tomatoes.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 601-10, bibl. 15, illus.

Tomato plants were grown at soil temperatures of

55°, 70° and 85° F. with 5 levels of P. The dry weight of tomato plants was much less at a soil temperature of 55° than at 70° or 85° F. There was no significant difference between growth at 70° and 85°. Tomato plants were relatively more responsive to added P at the lowest temperature than at the two higher temperatures. Growth increased linearly with increasing rates of P up to the highest level applied when the soil temperature was 55° F.; at the higher soil temperatures the growth tended to reach a maximum and then level off. The investigation indicated that this difference in response to P was not due to a direct effect of temperature on phosphate availability in the soil. The P concentration in the plant increased with increasing temperature and increasing P level. The uptake of P with increased P in the medium was correlated with growth and was linear at 55° but curvilinear at 70° and 85° F. Dry weight percentages were higher in plants grown at the lowest soil temperature than in plants grown at the higher soil temperatures. [From authors' summary.]—Purdue Univ., Lafayette, Ind.

804. Kirsch, R. K., Harward, M. E., and Petersen, R. G.
Interrelationships among iron, manganese, and molybdenum in the growth and nutrition of tomatoes grown in culture solution.
Plant and Soil, 1960, **12**: 259-75, bibl. 15.

Dry matter determinations on roots, stems, petioles and leaves of tomato plants grown for 36 days in nutrient solutions led to the following conclusions. The Fe/Mo and Fe/Mn interactions on dry matter production were more pronounced than the Mn/Mo interaction, and there was a strong indication of an interaction involving Fe, Mn and Mo. Added Fe counteracted the yield-depressing effect of added Mn, but the amount of Fe required to produce the maximum of dry matter increased as the Mo supply was increased. The addition of Mo was depressing at low Fe levels, but stimulating at higher Fe levels. Additions of Fe appeared to increase the translocation of Mo from the roots to the leaves, but reduced the total Mo uptake. Added Mo tended to accumulate in toxic amounts in the roots if the Fe level was low. The effect of added Mo on Mn uptake was negligible when Fe and Mn levels were low, depressing when Fe was low and Mn high, and stimulating when both Fe and Mn were high.[See also *H.A.*, 29: 2570.]—Ore. agric. Exp. Stat., Corvallis.

805. Novoderžkina, Ju. G.
The effect of microelements in increasing the vitamin C synthesis in tomatoes. [Russian, with English summary 4 lines.]
Fiziol. Rast., 1960, **7**: 121-3, bibl. 8.

Alternate soil and foliar applications of B + Cu + Mn + Mg increased the vitamin C content of glasshouse tomatoes by up to 81%. The vitamin content of the treated glasshouse crops was similar to that of outdoor tomatoes.

806. Lingle, J. C.
Foliar absorption of zinc by tomato plants.
Calif. Agric., 1960, **14(7)**: 4.

Initial results of tracer studies suggest that zinc absorbed through the foliage is not translocated to the roots to any great extent but is localized in the young tissues at the top of the plant. Absorption of zinc also appears to take place mostly during daylight hours.—Univ. Calif., Davis.

807. Wu, C. M., and Tsui, C.
The effect of zinc on the activities of catalase, peroxidase and polyphenyl oxidase in the tomato plant. [Chinese, with English summary ¼ p.]
Acta bot. sin., 1959, **8**: 243-6, bibl. 17.

The enzyme activity of Zn-deficient plants was considerably lower than that of normal plants. In the later stages of growth the catalase and polyphenol oxidase activities of the normal plants were 4 times higher than those of Zn deficient plants. When the symptoms of Zn deficiency first appeared, peroxidase activity was higher than in normal plants, but it became lower when the plants showed serious symptoms. After zinc sulphate was added to the culture solution in which the Zn-deficient plants were grown, the activities of the 3 enzymes increased gradually to the levels found in the normal plants. The time taken to recover varied, peroxidase recovering first, polyphenol oxidase second and catalase last.

808. Lambeth, V. N.
Keep your tomatoes cool.
Amer. Veg. Gr, 1960, **8**(6): 11, 33, 35.

In Missouri field-grown tomatoes require 18–20 in. of water. Irrigation should start when the available soil moisture falls to 40% of field capacity.—Univ. Mo, Columbia.

809. Belik, V. F.
The determination of the water requirement of tomatoes based on the osmotic pressure and cell sap concentration of the leaves. [Russian.]
Fiziol. Rast., 1960, **7**: 95-7, bibl. 10.

In glasshouse pot experiments the osmotic pressure of tomato leaves was found to increase as the soil moisture decreased. The cell sap concentration throughout the growing period with different soil moisture contents ranged from 7·0 to 10·5%, being 8–9% at the optimum soil moisture of 60–70% of field capacity. In the field under irrigation the soil moisture averaged 87% of field capacity and the cell sap concentration 8%. Tomatoes should be watered when the cell sap concentration rises to 10–10·5%.

Tomatoes—environment, growth and physiology.

(*See also* 9, 93, 665, 772, 824, 838.)

10. STATENS FORSØGSVIRKSOMHED I PLANTEKULTUR.
Forsøg med dyrkning af tomater i vaeksthus ved forskellige luft- og jordtemperaturer 1953-56. **(Experiments on different air and soil temperatures for glasshouse tomatoes, 1953-56.)**
Tidsskr. Planteavl, 1960, **64**: 163-6.

oil heating had an unfavourable effect on tomato elds. The most economical air temperature for ort-term culture aiming at high early yields was ° C. Tomatoes grown for high total yields nerally did best at 25° C. The highest percentage pollen germination was obtained at 20° C.

11. KETELLAPPER, H. J.
Interaction of endogenous and environmental periods in plant growth.
Plant Physiol., 1960, **35**: 238-41, bibl. 9.

eductions in the growth of tomato plants caused unfavourable temperature can be prevented to a rtain extent by adjusting the length of the lightirk cycle under which the plants are grown. The cle length which produces optimal growth is 22 ours at 23° C., 27 to 30 hours at 14° C., and 20 ours at 30° C. Environmental conditions which eaken the plant increase the response to changes length of the environmental cycle. [From ithor's summary. See also *H.A.*, 30: 1542.]—alif. Inst. Technol., Pasadena.

12. KUDRJAVCEV, V. A.
The importance of light intensity and reducing processes in the formation of generative organs in plants. [Russian.]
Doklady Akad. Nauk, S.S.S.R., 1960, **131**: 453-6, bibl. 13.

he reducing ability of tomato leaf and flower bud ssues was measured iodometrically and was found be decreased by reducing light intensity to 20% of ll daylight. Reducing ability was increased again returning the plants to full light. Reducing ght intensity when pollen mother cells were at the trad stage caused a decrease in the reducing ability d also in the fertility of the flowers. Flower ssues higher up the plant had a higher reducing oility and were less sensitive to reductions in light tensity.

13. ABD EL RAHMAN, A. A., KUIPER, P. J. C., AND BIERHUIZEN, J. F.
Preliminary observations on the effect of light intensity and photoperiod on transpiration and growth of young tomato plants under controlled conditions.
Meded. LandbHogesch., Wageningen, 1959, **59**(11): 1-12, bibl. 12, illus.

As the light intensity was increased, linear increases were also observed in the transpiration rate, the total amount of water transpired and the fresh and dry weights of young tomato plants. The water requirement was high at low light intensities and decreased at higher light intensities. Photoperiodic responses could be explained in terms of the total amount of light received by the plants.—Lab. Plant physiol. Res., Wageningen.

814. ABD EL RAHMAN, A. A., KUIPER, P. J. C., AND BIERHUIZEN, J. F.
Preliminary observations on the effect of soil temperature on transpiration and growth of young tomato plants under controlled conditions.
Meded. LandbHogesch., Wageningen, 1959, **59**(15): 1-12, bibl. 18, illus.

As the soil temperature dropped from 29·9° C. to 16·8° C. there was a reduction in transpiration rate, with a corresponding large reduction in the total amount of water transpired by young tomato plants. The total leaf area increased with temperature, while stem height and gain in dry weight were maximal at about 25° C.—Lab. Plant physiol. Res., Wageningen.

815. BIERHUIZEN, J. F., ABD EL RAHMAN, A. A., AND KUIPER, P. J. C.
The effect of nitrogen application and water supply on growth and water requirement of tomato under controlled conditions.
Meded. LandbHogesch., Wageningen, 1959, **59**(16): 1-8, bibl. 6, illus.

Leaf and internode numbers and stem diameter were not significantly affected by 5 levels of nitrate or 3 levels of soil moisture. The total leaf surface did increase with an increase in N and water supply. The water content of the plants increased with an increase in N. The dry weight of the roots was higher with a higher water supply but was lower with higher N levels. Thus the shoot/root ratio was considerably increased by higher N levels. The transpiration rate per unit leaf area was not affected by the N level, but was largely dependent on the soil moisture content.—Lab. Plant physiol. Res., Wageningen.

816. WASSINK, E. C., AND KUIPER, P. J. C.
Some remarks on factors determining the water requirement in tomato plants under controlled conditions.
Meded. LandbHogesch., Wageningen, 1959, **59**(17): 1-8, bibl. 2.

Some results of a previously published experiment from this laboratory on the effect of temperature and water supply on growth, transpiration and water requirement of tomato plants [see *H.A.*, 30: 3912] are discussed. The water requirement has been recalculated from data on evapo-transpiration and dry matter production, introducing more or less idealized curves for the evaporation rate. By plotting the water requirement against water supply typical curves of the "Blackman" type are obtained, indicating the presence of two mutually independent limiting factors. At higher temperatures the water requirement is limited by the availability of water from the soil within a wide range of water supply. The saturation levels found at lower temperatures coincide with the corresponding "Piche" evaporation measurement and with the values of vapour pressure deficit. [Authors' summary.]—Lab. Plant physiol. Res., Wageningen.

817. BOSE, P. C.
Growth, development and mineral uptake in tomato plants, as affected by maleic hydrazide and gibberellin.
Diss. Abstr., 1960, **21**: 13-14, being *L.C. Card No. Mic.* 60-2368 of 104 pp.

The growth of John Baer tomatoes grown in nutrient solution in a glasshouse was inhibited by MH applied at 10, 50 or 100 p.p.m. to the leaves, root growth being affected more than shoot growth. At 10 p.p.m. the inhibition was only temporary, but it persisted at higher rates of application. The uptake and content of various minerals showed decreasing values as MH concentrations increased. Foliar applications of GA, applied as 100, 250 or 500 p.p.m. of potassium gibberellate, stimulated growth, and the magnitude of elongation was related to GA concentration. These growth differences were attributed to increased uptake of water and K by plants given the higher rates of GA. No significant differences in the size of the largest leaf or the number of flowers were observed between treatments. Fruit numbers of GA-treated plants were lower than those of the controls. Treated plants produced misshapen fruits. Treated plants also showed chlorosis of the lower leaves which may have been due to reduced uptake of Fe or Mn.—Mich. St. Univ.

818. GUSTAFSON, F. G.
Influence of gibberellic acid on setting and development of fruits in tomato.
Plant Physiol., 1960, **35**: 521-3, bibl. 13.

In a comparative study of IAA, 2,3,6-trichlorobenzoic acid and GA only 0·5 and 1·0% GA induced the formation of parthenocarpic fruits. When flowers and flower buds of the first 3 clusters were sprayed with 35 and 70 p.p.m. GA, setting was enhanced but the total weight of fruits produced was lower. When only the first cluster was sprayed the number of fruits set and the total weight per cluster was increased, but this response did not occur in subsequent clusters.—Univ. Mich., Ann Arbor.

819. KIERMAYER, O.
Induktion von Ringfasciation bei *Lycopersicon esculentum* durch Phthalsäuremono-α-naphthylamid (PNA). **(The induction of ring fasciation in tomato with the aid of the mono-α-naphthylamide of phthalic acid.)**
Naturwissenschaften, 1960, **47**: 190-1, bibl. 6.

PNA produced formative effects on tomato plants very similar to those attributed to TIBA.

820. ZAHARČIŠINA, V. A.
Variations in the nucleic acid and vitamin C contents in solanaceous grafts and their seed progeny during development. [Russian, with English summary 8 lines.]
Fiziol. Rast., 1960, **7**: 67-72, bibl. 20.

The test objects were grafts and their seed progeny of an intervarietal combination of tomato on tomato and an interspecific combination of tomato on egg-plant. The leaves of the grafts and their progeny had higher contents of both ascorbic and nucleic acids than those of the respective scion varieties growing on their own roots. The nucleic acids content was highest during bud formation and the ascorbic acid content at the beginning of flowering at which time the DNA:RNA ratio increased. The content of nucleic acids declined steadily as the leaves became older.

Tomatoes—disorders, diseases and pests.

(*See also* 557, 562, 1665.)

821. MARTIN, P.
Les maladies des tomates de serre. **(Diseases of greenhouse tomatoes.)**
Rev. d'Oka, 1960, **34**: 74-80.

Symptoms are described of a number of fungus, virus, bacterial and physiological diseases, and detailed recommendations are given for greenhouse disinfection.

822. FENNE, S. B.
Tomato disease control.
Circ. Va Polytechnic Inst. **635**, revised 1960 pp. 16, illus.

Illustrated symptoms and control of bacterial fungal and physiological diseases.

823. MURAKISHI, H. H.
Present status of research on graywall and internal browning of tomato.
Quart. Bull. Mich. agric. Exp. Stat., 1960 **42**: 728-32, bibl. 9, illus.

In investigations on 3 varieties internal browning only occurred on plants infected with tobacco mosaic virus. Graywall occurred on plants free from TMV. Both disorders were worse unde conditions of low light intensity. The variet P.I.235673 was found to be resistant to both dis orders and to TMV. Manalucie showed considerable resistance to graywall.

824. Murakishi, H. H.
Comparative incidence of graywall and internal browning of tomato and sources of resistance.
Phytopathology, 1960, **50**: 408-12, bibl. 20.

Studies, in which both disorders were reproduced simultaneously, confirmed that they have nearly identical symptoms. Graywall was induced by low light intensity in TMV-free plants, whereas internal browning was caused by late infection with a strain of TMV; low light also increased the incidence of internal browning in susceptible varieties. Two graywall-resistant varieties, Indian River and Manalucie, were susceptible to internal browning, but 2 TMV-resistant breeding lines were resistant to both disorders. Internal browning and TMV reactions were correlated. [From author's summary. See also *H.A.*, 30: 5619.]—Mich. St. Univ., E. Lansing.

825. Flores, E., Silberschmidt, K., and Kramer, M.
Observações de clorose infecciosa das malváceas em tomateiros do campo. (**Observations on infectious chlorosis of the Malvaceae in outdoor tomatoes.**) [English summary 8 lines.]
Biológico, 1960, **26**: 65-9, bibl. 3, illus.

Symptoms and transmission by grafting and *Bemisia tabaci*.

826. Petzer, C. F.
Tomato canker now threat to farmers in winter rainfall region.
Fmg S. Afr., 1960, **36**(5): 9-11, illus.

The fermentation of tomato fruits for 3 or more days before seed drying reduces the incidence of infection by *Corynebacterium michiganense*, but the only satisfactory control measure is to use seed which is known to have come from a canker-free area. As the causal bacteria survive for at least 2 years in the soil, infected plants should be destroyed, supports, implements, etc. disinfected, and tomatoes excluded from the area in favour of other crops for 2–3 years.

827. Conover, R. A., and Stall, R. E.
Use of combinations of maneb and Dyrene for control of tomato diseases.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 204-7, bibl. 5.

A routine spray of 1 lb. maneb + 1 lb. Dyrene in 100 gal. water is recommended against grey leaf spot (*Stemphylium solani*), botrytis grey mould (*B. cinerea*) and late blight (*Phytophthora infestans*), with suggestions for adjusting the programme according to the prevalence of the 3 diseases.—Sub-Trop. Exp. Stat., Homestead, and Indian River Field Lab., Fort Pierce.

828. Conover, R. A.
Verticillium wilt of tomato in Dade County, Florida.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 199-201, bibl. 11.

Varieties found resistant to *Verticillium albo-atrum* produced very low yields of poor quality.

829. Matta, A., and Vittone, A.
Impiego dei derivati del piridinetiolo nella lotta contro la verticilliose del pomodoro. 1. Ricerche sperimentali sul comportamento dell'Omadine nel terreno. (**Pyridinethiol derivatives as possible control substances for *Verticillium* wilt disease of tomatoes. 1. Trials on the behaviour of Omadine in the soil.**)
Not. Mal. Piante, 1960, No. 52, pp. 91-103, bibl. 10.

Studies on persistence and movement in the soil.

830. Egan, H., and Lidzey, R. G.
Phenylmercury salicylate residues in commercial glasshouse tomato crops.
Plant Path., 1960, **9**: 88-91, bibl. 4.

Analyses of fruit from 40 crops treated with phenylmercury salicylate aerosols indicated that, when it is applied at the recommended rate (not more than 40 mg. of Hg per 1,000 cu. ft. of glasshouse space) at 6- to 10-day intervals, the total mercury residue is unlikely to exceed 0·01 (n+1) p.p.m., where n, the number of applications, does not exceed 8. [From authors' summary.]—D.S.I.R., London.

831. Mason, H. C., Henneberry, T. J., and Lehr, R.
Reaction of *Drosophila* to different varieties of tomatoes.
J. econ. Ent., 1960, **53**: 337-9, bibl. 2, illus.

Of 15 varieties tested at Beltsville, San Marzano and Pennheart were the least, and Rutgers the most, attractive to *Drosophila melanogaster*.

832. Baranowski, R. M.
Effects of combining hydrocarbon insecticides with parathion or diazinon for leaf miner control on tomatoes.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 155-8, bibl. 5.

The addition of DDT to diazinon significantly reduced the effectiveness of the latter against *Liriomyza subpusilla*, whereas the addition of toxaphene increased the effectiveness of parathion, although this combination did not give as good control as did diazinon alone.—Sub-Trop. Exp. Stat., Homestead.

833. Baranowski, R. M.
Preliminary work with systemic insecticides on tomatoes.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 158-60, bibl. 6.

Thimet, applied alone or with fertilizer, was the most effective of the 3 materials tested for the control of serpentine leaf miner, *Liriomyza pusilla*, and some other insects. Di-Syston was also promising.—Sub-Trop. Exp. Stat., Homestead.

834. ANON.
The tomato mite (*Vasates lycopersici*).
Agric. Gaz. N.S.W., 1960, **71**: 243-4, illus.

Advice on control with lime-sulphur, sulphur, malathion, DDT and Rogor.

Tomatoes—fruit harvesting and composition.

835. MACGILLIVRAY, J. H.
Effects of chemical defoliation of canning tomatoes.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 625-8, bibl. 1.

Defoliation of tomato plants with sodium chlorate shortly before the first picking had only slight and unimportant effects on speed of picking, yield, grade, fruit temperature and rate of fruit ripening. Defoliation, however, tended to reduce the soluble solids content of the fruit and the percentage of green-wrap tomatoes that ripened normally.—Univ. Calif., Davis.

836. RIES, S. K., AND STOUT, B. A.
A progress report on horticultural problems associated with a mechanical tomato harvester.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 632-7, bibl. 2, illus.

A tomato harvesting machine built at Michigan State University in 1958 is described and illustrated. The entire crop is harvested in a single operation. Its use will require the choice of suitable varieties and the modification of cultural and handling methods. The economics and possibilities of mechanical harvesting are discussed.

837. HALL, C. B., AND DENNISON, R. A.
The relationship of firmness and pectinesterase activity of tomato fruits.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 629-31, bibl. 4.

No significant correlation was found.

838. KORBONITS, A.
A paradicsom szárazanyagtartalmának változása egyes környezeti és müvelési tényezók hatására. (**Changes in the dry matter content of tomatoes as affected by some environmental and cultural factors.**)
Konzerv. hűtőip. Kutatóint. Közl., 1959, No. 1-2, pp. 5-13, from *Hung. agric. Rev.*, 1960, **9**, Abstr. 27.

Changes in the dry matter content of tomatoes during ripening were not affected by the length of the growing period but depended entirely on environmental factors, the most important of which was rainfall. The dry matter content of the fruits was higher from plants grown on drier, heavier loams than from those grown on soils with a high moisture content. A high humus content of the soil and high plant density also increased the dry matter in the fruit. No relationship was found between the colour of tomato varieties and dry matter content, but in certain varieties early maturity and dry matter content were inversely related. In fertile soils yields and dry matter content were related, but in poorer soils this relationship was only found in varieties with low nutrient requirements.

839. MCCOLLUM, J. P., AND SKOK, J.
Radiocarbon studies on the translocation of organic constituents into ripening tomato fruits.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 611-16, bibl. 5.

Experiments with labelled phosphate, glucose and photosynthetic products supplied at various stages of fruit development showed that most organic constituents have entered the fruit by about 5 days after the turning stage. It is concluded that quality of tomatoes could be considerably improved if they were harvested when they began to turn colour rather than at the mature green stage, but that quality would not be impaired if they were harvested at the full-ripe stage.—Univ. Ill., Urbana, and Argonne nat. Lab., Lemont, Ill.

840. KARGL, T. E., QUACKENBUSH, F. W., AND TOMES, M. L.
The carotene-polyene system in a strain of tomatoes high in delta-carotene and its comparison with eight other tomato strains.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 574-8, bibl. 7.

The data indicate that tomatoes appear to fall into two groups: those having predominantly alicyclic C_{40} polyenes, and those having predominantly acyclic polyenes. Within these groups are classes, which differ in degree of conjugated unsaturation or ionone ring formation. [From authors' summary.]—Purdue Univ., Lafayette, Ind.

841. BRADLEY, D. B.
The separation of organic and inorganic acid anions in filtered tomato purée by partition chromatography.
J. agric. Food Chem., 1960, **8**: 232-4, bibl. 9.

Acetic, lactic, fumaric, malic, pyrrolidone carboxylic, citric, phosphoric, hydrochloric, sulphuric and galacturonic acids were detected in tomato pulp by a method employing silicic acid partition chromatography.—Campbell Soup Co., Riverton, N.J.

Sundry crops.

842. IMAZU, T., AND OSAWA, T.
Studies on udo, *Aralia cordata* Thunb. III. Variations among domestic and wild udos with special reference to their morphological characters. [Japanese, with English summary ½ p.]
J. hort. Ass. Japan, 1960, **29**: 1-6, bibl. 5, illus.

Wild udos show wide variation, the geographic differences being related to latitude and altitude, and can be grouped into northern and southern types. Varietal variation in cultivated udos is less wide and all appear to be of the southern type. [For part II see *H.A.*, 29: 1551.]

843. BUSSON, F., AND OTHERS.
Contribution à l'étude botanique et chimique des tubercules de *Coleus rotundifolius* (Poir.) A. Chevalier. (**A contribution to the botanical and chemical study of the tubers of *Coleus rotundifolius*.**)
J. Agric. trop. Bot. appl., 1959, **6**: 675-9, bibl. 13, illus.

The composition and nutritive value of the tubers of this Sudanese vegetable are compared with those of potatoes. Attempts to grow the plant at Marseilles were not very successful owing to the use of the wrong type of soil.—Lab. Rech. biochim., Serv. Santé Troupes d'Outre-Mer, Marseille.

TOBACCO.

General.

844. MICHE, A.
Le tabac à la Station de Mulungu-Tshibinda. (Premiers résultats.) (**Tobacco at Mulungu-Tshibinda Station. First results.**)
Bull. Inf. I.N.É.A.C., 1960, **9**: 149-60, bibl. 2, illus.

The results are given of trials with 165 varieties of tobacco at this station. Special attention was paid to nursery procedure, and investigations into fertilizer requirements and pest control were started. The highest yield was obtained from Ehlers, with a local variety, Kimongo, coming second.

845. TUBOLY, L.
Szivardohányok termesztése Magyarországon. (**Growing cigar tobacco in Hungary.**)
Dohányipar, 1959, No. 9, pp. 146-50, from *Hung. agric. Rev.*, 1960, **9**, Abstr. 20.

Including mention of a superior new selection.

846. ANIŢIA, N., AND DĂNĂU, C.
Zonarea culturilor de tutun în R.P.R. (**The distribution of tobacco growing in the Romanian P.R.**) [French and Russian summaries ¼ p. each.]
Lucr. Inst. Cerc. Alim., 1959, **4**: 97-105, bibl. 9.

With map of climato-pedological zones.

847. COCULESCU, G., AND DĂNĂU, C.
Cultura tutunului de tip Virginia pe terenurile nisipoase din sudul Olteniei. (**Growing Virginia-type tobacco on the sandy soils of southern Oltenia [Romania].**) [French and Russian summaries, 9 lines each.]
Lucr. Inst. Cerc. Alim., 1959, **4**: 159-71, bibl. 10.

Methods which will produce high yields on these unproductive sandy soils.

848. ANIŢIA, N.
Rezultatele principale obţinute în cercetările privind cultura tutunului în perioada 1928-1958. (**The main results of the research on tobacco growing in the period 1928-1958.**) [French and Russian summaries ¼ p. each.]
Lucr. Inst. Cerc. Alim., 1959, **4**: 11-27, bibl. 140.

A review of Romanian work with a classified bibliography.

849. TRIFU, I.
Rezultatele principale obţinute în cercetările privind tehnologia tutunului în perioada 1928-1958. (**Results of tobacco technology research in the period 1928-1958.**) [French and Russian summaries 5 and 7 lines.]
Lucr. Inst. Cerc. Alim., 1959, **4**: 29-37, bibl. 69.

A review of work in Romania.

850. PIENAAR, E. W.
Turkish tobacco cultivated in Western Province only.
Fmg S. Afr., 1960, **36**(5) : 34-5, illus.

Brief notes on manuring, harvesting, curing and baling.

851. WANROOY, G. L.
Report to the Government of the Sudan on tobacco production.
Rep. ETAP/FAO **1197**, 1960, pp. 49, bibl. 11.

The report makes recommendations on ways of increasing yields, improving quality and curing, especially for small farmers. There is a comprehensive appendix on the techniques of production and processing.

852. ANON.
Tobacco—the family crop in Tobago.
J. agric. Soc. Trin. Tob., 1960, **60**: 65-86.

Advisory notes on growing, pests and diseases, harvesting and marketing.

853. Maier, F. H., Hedrick, J. L., and Gibson, W. L., Jr.
The sale value of flue-cured tobacco allotments.
Tech. Bull. Va agric. Exp. Stat. **148**, being *Publ. S.E. Land Tenure Res. Cttee* **35**, 1960, pp. 51.

An economic study of the influence of tobacco allotments on farm land values.

854. Balbi, G.
L'olio di tabacco nella fabbricazione di prodotti vernicianti. (**Tobacco seed oil in the production of paints and varnishes.**) [French, English and German summaries about 12 lines each.]
Olearia, 1959, **13**: 118-27, bibl. 57, illus.

Includes chemical composition.

Breeding and varieties.

(*See also* 902, 910.)

855. Ternovskij, M. F., and Terent'eva, M. I.
The role of grafts in increasing the crossing potential of *Nicotiana* species. [Russian.]
Doklady Akad. Nauk S.S.S.R., 1960, **132**: 932-5, bibl. 10.

The ability of *Nicotiana rustica* to hybridize with *N. glauca* was increased by up to 11% when the former was grafted on *N. glauca* rootstocks in the early cotyledonary stage. In other experiments with *N. tabacum* and *N. alata*, however, the expected results were not obtained, owing possibly to the use of older, more developed *N. tabacum* seedlings as scions. Certain tobacco varieties on their own roots, such as Hercegovina 395, Havana 1415, Gold Leaf 1814 and Burley 2293, showed a better ability to cross with *N. alata* than others, which included the mosaic-immune Trapezond 214 and the mosaic- and mildew-immune varieties Trapezond × Djubek and American 315.

856. Scossiroli, R. E., and Wittmer, G.
Ricerche genetiche su caratteri quantitativi in *Nicotiana*. Nota V. Studio della variabilità genetica di 6 caratteri quantitativi nella cultivar Virginia Bright. (**Genetical studies on quantitative characters in *Nicotiana*. Note V. The genetical variability of 6 characters in the variety Virginia Bright.**) [English summary ½ p.]
Tabacco, 1960, **64**: 98-103, bibl. 9.

Plant height, number, length, width and length/width ratio of leaves, and flowering date.

857. Krishnamurty, K. V., Murty, G. S., and Rao, K. A.
Cytogenetics of the trispecific hybrid *Nicotiana tabacum × (N. glutinosa × N. trigonophylla)* and its reciprocal. [Dutch summary ¼ p.]
Euphytica, 1960, **9**: 111-21, bibl. 16, illus.

Sterile hybrids, one of which set parthenocarpic capsules.

858. Office National du Tabac de Grèce.
La Grèce, pays producteur de tabac par excellence, avec ses variétés choisies de tabac d'orient. (**Greece, producer of quality tobacco, and its choice varieties of oriental tobacco.**)
Rev. int. Tabacs, 1960, **35**: 75-9, 90.

With notes on 7 oriental varieties, headed by selections of Basma.

859. Aniţia, N., and Ioan, E.
Raionarea soiurilor de tutun în R.P.R. (**The climato-pedological distribution of tobacco varieties in the Romanian P.R.**) [French and Russian summaries ⅓ p. each.]
Lucr. Inst. Cerc. Alim., 1959, **4**: 107-18, bibl. 9.

With a map and brief descriptions of the varieties.

860. Ioan, E., and Dănău, C.
Raionarea soiului de tutun Havana pe baza studiilor climato-pedologice. (**The distribution of the variety Havana based on climato-pedological studies.**) [French and Russian summaries ⅓ p. each.]
Lucr. Inst. Cerc. Alim., 1959, **4**: 119-28, bibl. 6.

The most favourable conditions were found in the Muras valley and part of the Transylvanian plain on degraded chernozem and chestnut forest soils. Soil analyses are tabulated.

861. Ioan, E.
Ameliorarea soiurilor orientale de tutun Drăgăşani şi Molovata. (**Improvement of the oriental tobacco varieties Drăgăşani and Molovata.**) [French and Russian summaries ⅓ p. each.]
Lucr. Inst. Cerc. Alim., 1959, **4**: 129-37, bibl. 6.

The selections Drăgăşani 237 and Molovata 72 yielded more tobacco and were of better quality than the parent varieties.

862. Ioan, E., and Ille, C.
Linii superioare de tutun Djebel selectionate în R.P.R. (**Superior lines of Djebel tobacco selected in the Romanian P.R.**) [French and Russian summaries ¼ p. each.]
Lucr. Inst. Cerc. Alim., 1959, **4**: 139-48, bibl. 9.

Djebel 264 V, selected from Bulgarian strains, outyielded Drăgăşani by 22·5%, and gave 40·9% 1st and 2nd grade leaf compared with 23·8%.

863. Săndulescu, R.
Obţinerea unui soi de tutun de mare producţie. (**High yielding tobacco varieties.**) [French and Russian summaries 6 lines each.]
Lucr. Inst. Cerc. Alim., 1959, **4**: 149-54, bibl. 7.

elections Ialomita 101 and 94, yielding 16·2-4·4% more than the parent variety.

864. Săndulescu, R.
Obţinerea de forme gigante de tutun. **(Giant forms of tobacco.)** [French and Russian summaries 8 lines each.]
Lucr. Inst. Cerc. Alim., 1959, **4**: 155-8, bibl. 6, illus.

Obtained by crossing Maryland Mammoth with Molovata and named Gigant 412/56, these attained height of 4 m. with 100-115 leaves of low nicotine nd high carbohydrate content.

865. Henderson, R. G.
Performance of tobacco varieties and breeding lines tested in Virginia in 1958 and 1959.
Res. Rep. Va agric. Exp. Stat. **37**, 1960, pp. 59.

Flue-cured, fire-cured and burley.

Seed treatment and planting.

866. Čirkovskij, V. I.
Is it possible to obtain high quality seeds from the peripheral capsules of the tobacco inflorescence? [Russian.]
Tabak, 1960, **21**(2): 38-40.

The quality of tobacco seeds from the outer capsules s much lower than that from capsules in the centre of the inflorescence. However, when the central buds, flowers or capsules are removed, the quality of the seeds from the later developing peripheral apsules is much improved.

867. Wittmer, G.
Ricerche genetiche su caratteri quantitativi in *Nicotiana*. Notas III, IV. Influenza di trattamenti con raggi X applicati al seme sulla variabilità di alcuni caratteri fiorali. **(Genetical studies on quantitative features in *Nicotiana*. Notes III and IV. The effect of X-ray treatments of the seeds on the variability of certain floral characteristics.)** [English summaries ½ p. each.]
Tabacco, 1959, **63**: 385-97, bibl. 14, illus., and 398-406, bibl. 7.

Some differences in corolla shape and size were nduced by an X-ray dose of 18,096 r applied to eeds of the tobacco varieties Virginia Bright, Maryland and Burley. The effects of a 9,048 r dose were not significant, and those of 36,192 r were ethal. The X-ray sensitivity was particularly high n strain T.19 of Virginia Bright. [For earlier work on the subject see *H.A.*, 30: 2384.]

868. Guthrie, F. E., and others.
Mechanical transplanting of bright leaf tobacco. Part IV. Tobacco wireworm control with row treatment of insecticides.
Tobacco, N.Y., 1960, **150**(21): 21-7, bibl. 8, illus.

Adequate control of *Conoderus vespertinus* was obtained with chlorinated hydrocarbons applied in bands on the surface or in the furrows. Control was enhanced by making the application as long before planting as practicable, by frequent tillage, by applying the insecticides to the soil during tillage and by increased power of tilling machinery. The normal insecticide-fertilizer mixture with conventional application was less successful. [For Part III, see *H.A.*, 30: 2398.]—N.C. State Coll., Raleigh.

869. Splinter, W. E., and Suggs, C. W.
Mechanical transplanting of bright leaf tobacco. Part V. Effects of transplanting and fertilizing methods on survival and performance.
Tobacco, N.Y., 1960, **150**(23): 23-32, bibl. 4, illus.

The use of large (22-in.) diameter press wheels to firm the soil around the transplants appeared to diminish the risk of drought damage but resulted in lower yields than when pressure plates were used for closing the furrows. Small (8-in.) diameter press wheels resulted in 50% higher transplanting losses than pressure plates. In drought conditions transplanting losses increased fivefold where pressure plates were used, and they were also increased by fertilizer placement before or during transplanting when large press wheels were used. The application of fertilizer before or during transplanting had no effect on yields but delayed growth and ripening. There was an interaction between type of transplanter and fertilizer placement by the once-over method (fertilizer placed in bands just ahead of the hilling disks mounted in front of the transplanter), the combination of pressure plates and fertilizer giving the highest losses, and large press wheels and fertilizer the lowest where adequate soil moisture was available, though not under drought conditions. —N.C. St. Coll., Raleigh.

870. Aniţia, N., and Dănău, C.
Experienţe cu spaţii de nutriţie şi îngrăşăminte la soiul Burley. **(Spacing and manurial experiments on the variety Burley.)** [French and Russian summaries ½ p. each.]
Lucr. Inst. Cerc. Alim., 1959, **4**: 187-98, bibl. 3.

Yield of tobacco per ha. fell, but the yield per plant rose, as the spacing was increased, especially after the application of fertilizer. The quality of the manufactured leaf was better from the fertilized plots and from the wider spacings, and these conditions also reduced the vegetative period. A planting distance of 60 × 40 cm. is recommended.

Rotations, nutrition and irrigation.

(*See also* 602, 900, 914, 1669.)

871. Vorster, S. F.
Conserve soil by rotating Turkish tobacco with winter annuals.
Fmg S. Afr., 1960, **36**(5): 30-2, illus.

Oats, lupins and a mixture of both were compared with a bare fallow alternation for Turkish tobacco. The best quality tobacco was that following oats and supplied with mineral N. That following oats + lupins and not supplied with mineral N was also good. Both treatments were more profitable than winter fallowing. Lupins alone, whether cut or ploughed in, raised soil N too high for producing good quality tobacco.—Stellenbosch-Elsenburg Coll. Agric.

872. Patrick, Z. A.
The effect of preceding crops, crop residues and soil toxins on growth of tobacco.
Lighter, 1960, **30**(2): 21-3, bibl. 1.

Of crops found to produce decomposition products in the soil that were toxic tobacco timothy grass was the most toxic, followed by maize, rye and tobacco itself. Factors influencing the development of the toxins were the type, moisture content, acidity and temperature of the soil. Even a relatively brief period of flooding (3–5 days) resulted in high toxicity, as did the maintenance of a pH below 6 during decomposition. The speed at which toxicity developed and the duration of toxicity were positively correlated with the age of the plants when ploughed in. The toxins also greatly reduced the resistance of tobacco varieties to infection by the black root rot fungus, *Thielaviopsis basicola.*—Harrow Res. Stat., Ont.

873. Patel, R. M.
Effect of decomposition products from certain forage crops on tobacco seed germination and seedling growth.
Diss. Abstr., 1960, **20**: 4236, being *L.C. Card No. Mic.* 60-1014, of 77 pp.

The toxicity of leachates from the decomposition products of several grasses and cereals was studied. Timothy grass produced the most toxic leachate. Decomposition in certain types of soil did not produce toxins, but tobacco plants grew less well in Timothy sod soil than in compost soil. Chemical studies on Timothy decomposition products are described.—Univ. Wis.

874. Ferguson, T. P., and Weaving, A. S.
Studies in the growing of flue-cured tobacco. I. The influence of nutrition on the yield, quality and polyphenol content of greenhouse tobacco.
Tobacco, N.Y., 1960, **150**(16): 19-25, bibl. 19.

The leaves of Hicks Broadleaf plants grown in sand culture in a glasshouse with full nutrient solution compared favourably with certain commercial grades, except in total sugars and equilibrium moisture contents. The same pattern of polyphenols was found as in field-grown leaf, but, whereas the chlorogenic acid content was similar, the amount of rutin was less [see also *H.A.*, 29: 1580].—Imp. Tob. Co., Bristol.

875. van der Ven, L.F.J.M.
The effect of nitrogen and potassium manuring on yield and chemical composition of Dutch cigar tobacco. [In Dutch?]
RijkstuinbConsul. Tabaksaangel. Wageningen, 1959, p. 45, from *Abstract Card Inst. Tabakforsch., Dresden*, No. 60/318.

Yields were increased by 54–71% by N manuring, whereas K manuring did not increase yields. Dry weights were reduced by both N and K. Ash contents decreased with N, and increased with K, manuring.

876. Aniţia, N., and Ille, C.
Cercetări privind influenta azotului asupra tutunului. (**The influence of nitrogen on tobacco.**) [French and Russian summaries ½ and ¾ p.].
Lucr. Inst. Cerc. Alim., 1959, **4**: 173-86, bibl. 21.

Experiments are described, in which the yield of dry matter in the leaves, their length and size and the height of the plants increased with increasing applications of N when there was adequate soil moisture but decreased when heavy applications were made with inadequate soil moisture. The water taken up by the plant during irrigation increased with N application. The vegetative period was shortest when medium doses of N were given with a low soil moisture, became longer with larger amounts of N and was longest with the maximum N application combined with adequate moisture. Variations in the nicotine and protein contents closely followed those of yield and size, but variations in the carbohydrate and resin contents and the Smuc coefficient showed a negative correlation.

877. Takahashi, T., and others.
Studies on the effect of compound fertilizers containing urea on tobacco. Parts I-VII. [Japanese, with English summaries to each part.]
Bull. Hatano Tobacco exp. Stat., 1958, No. 43, pp. 1-144, bibls, illus.

I. *Comparison between the effects of urea and ammonium sulphate on tobacco with special reference to their level of application:* Increasing the amount of urea applied increased the yield without affecting quality. On very dry soils a ceiling was reached, above which higher applications retarded growth. II. *The relationship between the effects of a compound fertilizer containing urea and its ammonia content:* In the early stages the greater the amount of NH_4 in the fertilizer, the more vigorous was the growth. After topping, however, NH_4 retarded leaf ripening. III. *Influence of particle size on the effects of compound fertilizers containing urea:* Field studies showed a fine state of division to be preferable on sandy soils in warm sites with a heavy rainfall, hereas a more granular fertilizer gave better sults on loamy soils where the rainfall was w. IV. *Effects of joint applications of compound rtilizers containing urea and rape seed cake:* he effects of the urea-containing compounds ere greater than those containing rape seed cake. joint applications the preferred method was to se the urea compound as a basal dressing and the pe seed cake as a side dressing. V. *Comparison tween the effects of compound fertilizers containing ea, urea and rape seed cake:* The compound conining urea gave better results than either urea rape seed cake alone in terms of both yield and uality. VI. *Behaviour of nitrogen components compound fertilizers containing urea:* Mineraliation of the N in compound fertilizers was more pid in the presence of urea than in the presence f rape seed cake. Leaching was less than with urea one, but greater than with ammonium sulphate or pe seed cake. VII. *Comparison between the effects nd processes of nutrient absorption of compound rtilizers containing urea and rape seed cake, with ecial reference to varying the amounts of fertilizer nd the methods of application:* The effects on rowth, yield and quality of 3 levels of N applicaon and 4 proportions of basal dressing to total pplication were studied, using both a urea-ontaining compound fertilizer and rape seed cake. n 4 out of 6 years the urea compound gave better esults, but in the 2 years in which heavy rain folowed transplanting the rape seed cake was more ffective. At the highest N level rape seed cake roved the more profitable fertilizer. The basal ressing had a greater effect in the drier years, the ide dressings in the wetter years. Urea tended to ncrease the size of the midrib and the nicotine ontent of the leaf. The absorption of N by the lant in the early stages was greater from the urea nd from the basal dressing. There were small ifferences in the uptake of P, K and Mg between he fertilizers, but the application of rape seed cake ed to a marked increase in the absorption of Mn.

878. Parups, E. V., Nielsen, K. F., and Bourget, S. J.

The growth, nicotine and phosphorus content of tobacco grown at different soil temperature, moisture and phosphorus levels.

Canad. J. Plant Sci., 1960, **40**: 516-23, bibl. 11.

The variety Hicks was grown at combinations of 3 soil temperatures, 4 soil moisture levels and 3 soil P treatments. A soil temperature of 22° C. and oil moisture of 75% of available moisture appeared o be the best for the over-all growth of tobacco. The over-all growth was a little lower at 30° C. soil emperature than at 22° C., and at 14° C. it was very oor. Nicotine and P contents in leaf tissue decreased with decreasing soil temperature. A decrease in soil moisture reduced growth but ncreased the nicotine content. P content was influenced little by soil moisture treatments. Low soil moisture treatments were more detrimental to growth of tobacco at the low soil temperature than at the higher ones. P produced growth responses at the low soil temperature only. Nicotine content was not influenced by soil P treatments. P applications increased the leaf P content. At 14° C. soil temperature there was an increase in leaf and stalk weight and leaf area with added P, whereas at 22° and 30° C. increases with soil temperature were very small. Stalk weights increased with increasing P applications at the higher but not at the lower soil moisture levels. Growth was decreased more at the soil temperature of 14° C. with soil moisture treatments of 25% and near to 0% of available moisture than at the soil temperatures of 22° and 30° C. With low soil moisture P applications decreased root growth, whereas with higher soil moisture treatments this P effect was reversed.—[From authors' abstract. See also *H.A.*, 30: 5667.]—Dep. Agric., Ottawa.

879. Welkie, G. W., and Miller, G. W.

Iron nutrition of *Nicotiana tabacum* L. in relation to riboflavin, riboflavin-5-phosphate, and flavin adenine dinucleotide content.

Plant Physiol., 1960, **35**: 516-20, bibl. 16.

Riboflavin was excreted in trace quantities from the roots of tobacco plants grown in nutrient solution, but a deficiency of Fe in the solution resulted in a 1,000-fold increase in the amount of riboflavin excreted. Iron deficiency also produced 10-fold increases in the concentrations of free riboflavin and flavinmonophosphate (FMN) in tobacco leaves but did not change the flavin adenine dinucleotide (FAD) level. The addition of Fe to Fe-deficient plants and the addition of riboflavin to normal plants both resulted in the disappearance of excreted riboflavin. The increased free riboflavin and FMN in Fe-deficient leaves did not enhance the activity of 2 enzymes tested.—Utah St. Univ., Logan.

880. Peele, T. C., Webb, H. J., and Bullock, J. F.

Chemical composition of irrigation waters in the South Carolina coastal plain and effects of chlorides in irrigation water on the quality of flue-cured tobacco.

Agron. J., 1960, **52**: 464-7, bibl. 9.

The chloride content of the waters examined ranged from 4 to 55 p.p.m., and the average increase in percentage chlorine in the cured leaf was 0·009 for each pound of chlorine added by the irrigation water. No significant differences in the nicotine content of the tobacco were found as a result of irrigation. Tobacco irrigated with water having 225 p.p.m. or more chloride had poorer smoking quality. Reducing sugars in the tobacco increased as the chloride content increased.—S.C. agric. Exp. Stat. and U.S.D.A.

Morphology, growth and quality.

(*See also* 877, 880, 1000, 1669.)

881. OKUMA, K.
Studies on the agronomical improvement of the quality of bright tobacco. [Japanese, with English summary 2½ pp.]
Bull. Hatano Tobacco Exp. Stat., 1959, No. 45, pp. 1-45, bibl. 43, illus.

Examination of leaf samples of bright tobacco from all districts in Japan showed that quality was closely associated with the development of the palisade and spongy parenchyma tissues, which in turn reflected the vigour of plant growth. The factors influencing growth were therefore studied. Maximum photosynthesis required a light intensity of 50 kilolux, and half maximum 10 kilolux. In cloudy weather in summer the light intensity fell to 5–10 kilolux. The temperature range for optimum growth lay between 26° and 30° C. The most suitable soil moisture condition appeared to be 55% of saturation. Any cultural practice which reduced the outflow of carbohydrates from the leaves improved quality, for example the removal of suckers and topping. The correct time for harvesting could be ascertained by determining the leaf reflectance at 670 mμ, which should be 20% above that of the full green stage. Nitrogen fertilizers should be used with discrimination, balancing their favourable effect on growth with their deleterious effect on quality.

882. SUGGS, C. W., AND SPLINTER, W. E.
Physical properties of green Virginia-type tobacco leaves. Part II. Frictional characteristics.
Tobacco, N.Y., 1960, **150**(17): 19-24, bibl. 5.

Immature, mature and over-mature leaves of the varieties Hicks, D.B.101, McNair 121, and N.C.73 were tested for frictional characteristics in contact with plywood, galvanized sheet metal and neoprene impregnated canvas. The mean angle of slide ranged from 45 to 54°, being 3 to 7° less than the angle of static friction. Factors significantly affecting the angle were leaf position and maturity, variety and material. The previous use of maleic hydrazide for sucker control in the plant had no appreciable effect on the angle. [For part I, see *H.A.*, 30: 803.]—N.C. St. Coll., Raleigh.

883. TOKITSU, T.
Development of adventitious roots in tobacco. [Japanese, with English summary.]
Proc. Crop Sci. Soc., Japan, 1958, **27**: 297-8, bibl. 5, from *Abstract Card Inst. Tabakforsch., Dresden*, No. 60/356.

The formation of adventitious roots began about 20 days after transplanting, and increased during bud and flower initiation. Lateral root formation started earlier in early-ripening varieties than in late-ripening varieties. Topping accelerated the development of adventitious roots. [See also *H.A.*, 29: 3753.]

884. ZVJAGINA, E. A.
The effect of gibberellin on tobacco. [Russian.]
Tabak, 1960, **21**(2): 41-2.

Gibberellin was applied to tobacco at 3 rates and by 4 different methods. All treatments induced stem elongation, advanced flowering and slightly increased the number of leaves per plant. The best results were obtained with repeated droplet applications of 0·02% GA to the growing point and with 2 spray applications at 10 p.p.m.

885. WITTMER, G.
Studio sulla combustibilità del tabacco. Nota 1. Risultati del primo anno di sperimentazione sul tabacco Kentucky. **(A study on the combustibility of tobacco. 1. Results of the first year's trials on Kentucky tobacco.)** [English summary ¾ p.]
Tabacco, 1960, **64**: 48-73, bibl. 38.

In trials on Kentucky Palù at 4 places in 3 provinces combustibility was (1) unaffected by irrigation, organic manuring and phosphatic fertilization, (2) better with topping at 8–9 leaves than with topping at 10–12 or 13–14 leaves, and (3) unaffected by time of harvesting at 3 places, but better with early than with normal harvesting at the 4th place. There was a positive interaction between early harvesting and high P in tobacco grown at two of the places.—Ist. sci. sper. Tab., Rome.

Physiology, biochemistry and crop composition.

(*See also* 55, 56, 61, 874, 875, 878, 879, 923.)

886. HARRIS, J. B.
Studies on changes in plastids and other cell particles during greening of the tobacco leaf.
Diss. Abstr., 1960, **20**: 3934-5, being *L.C. Card No. Mic.* 60-1236 of 131 pp.

A considerable amount of internal differentiation, paralleled by a loss of starch, resulted from 36 hours' continuous exposure of etiolated leaves to light. Ageing in etiolated leaves caused a loss of N and carotene from cell particles. In older etiolated leaves chlorophyll and carotene production was retarded, photosynthesis was delayed and the level of protein maintained was lower. Old leaves responded to pre-treatment in a nutrient solution by producing more chlorophyll, carotene and protein N.—Duke Univ.

887. JONES, H., MARTIN, R. V., AND PORTER, H. K.
Translocation of ^{14}carbon in tobacco following assimilation of ^{1} carbon dioxide by a single leaf.
Ann. Bot. Lond., 1959, **23**: 493-508, bibl. 21 illus.

$^{14}Co_2$ was assimilated by single leaves (presentation leaves) of tobacco plants for periods of 2–3 hours The plants were then kept in air in continuous ligh nd the redistribution of radioactivity was deterined at various times up to 96 hours. There was a omplete turnover of sucrose in the presentation af in about 24 hours without change in amount. tarch turned over more slowly and simultaneously icreased in amount. From 20 to 30% of the radioctivity appeared to be irreversibly incorporated into ie presentation leaf. Of the material exported from ie presentation leaf some 3% reached the upper aves and stem apex. Import into leaves above the resentation leaf was completed in about 6 hours. Io activity appeared in leaves below the presentaon leaf; therefore the balance of the exported ctivity was retained in the stem and roots. The disibution of radioactivity in the leaves followed a ell-defined pattern determined by the vascular iterconnexions. Radioautographs of stem sections rovided some information concerning distribution f radioactivity in the stem. [Authors' abstract.]—mp. Coll. Sci. Tech., London.

888. MOTHES, K., ENGLEBRECHT, L., AND KULAJEWA, O.
Action of kinetin on nitrogen distribution and protein synthesis in isolated leaves. [German ?]
Flora, 1959, **147**: 445-64, from abstr. in *J. Sci. Food Agric.*, 1960, **11**: ii-105.

reatment of limited areas of non-dividing tissue n excised tobacco leaves with kinetin caused a ocalized accumulation of soluble-N compounds, hich were drawn either from other parts of the leaf r from external applications. This translocation, hich occurred regardless of the direction of the oncentration gradient, was followed by intensive ynthesis of nucleic acid, protein and chlorophyll. See also abstract 62.]

889. VICKERY, H. B., AND ZELITCH, I.
The metabolism of the organic acids of tobacco leaves. XVII. Effect of culture of excised leaves in solutions of potassium pyruvate.
J. biol. Chem., 1960, **235**: 1871-5, bibl. 18.

ulture of tobacco leaves in 0·2 M solutions of otassium pyruvate has shown that citric acid ccumulates in substantial amounts, but that malic cid undergoes only a moderate change in quantity. Vhen pyruvate-2-C^{14} is made available, the specific ctivity of the citric acid is approximately equal to hat of the pyruvate, and both succinic and fumaric cids become highly labelled although only small mounts accumulate. The evidence indicates the resence of a condensing enzyme system similar in unction to that of Stern and Ochoa, and furthernore suggests the presence in the cells of the obacco leaf of two pools of citric acid. One of hese behaves as a storehouse for part of the ewly synthesized citric acid; the other is presumbly a centre of rapid metabolic activity if the nechanism of respiration is in fact that of the ricarboxylic acid cycle. However, the quantitative evidence that the entire respiration of the leaf is supported by this mechanism is still far from satisfactory. [Authors' summary. For part XVI, see *H.A.*, 29: 3761.]—Conn. agric. Exp. Stat., New Haven.

890. CLUTTER, M. E.
Hormonal induction of vascular tissue in tobacco pith in vitro.
Science, 1960, **132**: 548-9, bibl. 5, illus.

The direct addition of indole-3-acetic acid into sterile-cultured stem pith sections of *Nicotiana tabacum* through inserted glass pipettes has induced cell division and differentiation where such activity would not normally occur. This evidence lends support to the theory that IAA is the hormone that limits xylogenesis. [Author's abstract.]—Univ. Pittsburgh, Pa.

891. IMAI, S.
Alkaloids in *Nicotiana*. [Japanese, with English summary ¼ p.]
Bull. Hatano Tobacco Exp. Stat., 1959, No. 44, pp. 129-36, bibl. 8.

The results of analyses for nicotine, nornicotine and total alkaloids are recorded for 43 species of *Nicotiana*. Nornicotine was found to predominate in species with relatively few chromosomes and nicotine in those with larger numbers of chromosomes.

892. PODA-ČIKALENKO, V. T.
The formation and transformation of alkaloids during grafting. [Russian.]
Fiziol. Rast., 1960, **7**: 86-9, bibl. 24.

Mahorka (*Nicotiana rustica*) grafted on tomato, potato, scented tobacco (*N. affinis*) or nightshade did not synthesize nicotine. Tomato and potato on mahorka rootstocks did produce nicotine, but in scented tobacco grafted on mahorka nicotine only appeared when the leaf area of the rootstock was larger than that of the scion. It is suggested that in the scented tobacco on mahorka roots nicotine is converted into some other, as yet unidentified, alkaloid.

893. SĂNDULESCU, R., AND ILLE, C.
Rolul rădăcinii de tutun in formarea nicotinei. (**The role of the tobacco root in the formation of nicotine.**) [French and Russian summaries ¼ p. each.]
Lucr. Inst. Cerc. Alim., 1959, **4**: 199-202, bibl. 9.

Scions of *Nicotiana tabacum* and *N. rustica* grafted on tomato or potato stocks did not produce nicotine unless the scions developed roots. Nicotine appeared in scions of tomato and potato when these were grafted on tobacco stocks.

894. IL'IN, G. S.
Precursors of nicotine. [Russian, with English summary 10 lines.]
Fiziol. Rast., 1960, **7**: 57-61, bibl. 18.

Tobacco plants were grown in a Knop solution, to which over a period of 11–13 days C^{14}-labelled sodium bicarbonate, glycine, methyl amine, formaldehyde, acetic acid or glucose were added. C^{14}-methyl amine, glycine-2-C^{14}, acetic-2-C^{14}-acid and C^{14}-glucose were the most active compounds in the biosynthesis of nicotine, thereby indicating that, in addition to nitrogen, carbohydrate metabolism plays a part in nicotine synthesis.

895. Parups, E. V.
Effect of gibberellic acid applications to leaves of *Nicotiana* on nornicotine, anabasine, metanicotine, oxynicotine, and nicotinic acid content.
Tobacco, N.Y., 1960, **151**(7): 19-22, bibl. 9.

Applications of GA, either as a spray or to the nutrient medium, to species of *Nicotiana* and varieties of *N. tabacum* caused a decrease in the content of the 4 alkaloids named and of nicotinic acid, the precursor of nicotine.—Canada Dep. Agric., Ottawa.

896. Pierpoint, W. S.
Mitochondrial preparations from the leaves of tobacco *(Nicotiana tabacum)*. 2. Oxidative phosphorylation. 3. Glycollic oxidase and fumarase activity.
Biochem. J., 1960, **75**: 504-11, bibl. 28, and 511-15, bibl. 20.

The preparations described in Part 1 [see *H.A.*, 29: 3760] caused the phosphorylation of glucose and nucleotides with the absorption of oxygen and, in some cases, the evolution of CO_2. Glycollates and lactates were also oxidized, but the glycollic oxidase in the preparations was only 7·5% of the total present in the leaf extract. The fumarase content, however, amounted to 85–92% of that in the leaf extract.—Rothamsted Exp. Stat., Harpenden.

897. Phipps, J.
Sur l'existence d'un inhibiteur de l'auxine-oxydase du pois dans les extraits de feuilles de tabac ou de pomme de terre. **(The occurrence of pea auxin oxidase in leaf extracts from tobacco and potato.)**
C.R. hebd. Séances Acad. Sci., Toulouse, 1958, **247**: 1379-82, bibl. 6, from *Abstract Card Inst. Tabakforsch., Dresden*, No. 60/400.

898. Bentley, H. R., and Burgan, J. G.
Polynuclear hydrocarbons in tobacco and tobacco smoke. Part II. The origin of 3:4-benzopyrene found in tobacco and tobacco smoke. Part III. The inhibition of the formation of 3:4-benzopyrene in cigarette smoke.
Analyst, 1960, **85**: 723-7, bibl. 2, and 727-30, bibl. 12.

The methods used for determining 3:4-benzopyrene were described in Part I [*Analyst*, 1958, **83**: 442] The investigation reported in Part II indicates tha benzopyrene is not present in detectable amounts i freshly harvested tobacco leaves, and that it presence in manufactured tobacco results fron contamination during the various stages of curin and processing. Part III describes a method o treating cigarette tobacco which reduces th amount of benzopyrene in tobacco smoke by up t 80%.—Imp. Tob. Co. Ltd., Bristol.

899. Zaprometov, M. N., and Silina, E. I.
Shikimic acid in tobacco leaves. [Russian.]
Doklady Akad. Nauk S.S.S.R., 1960, **132**
704-7, bibl. 33.

About 0·03% of dry matter.

Disorders, diseases, pests and parasites.
(*See also* 611, 936, 937.)

900. Steinberg, R. A., and Bowling, J. D.
Induction of frenching of tobacco in the fiel
Tobacco, N.Y., 1960, **150**(22): 67-72, bibl. 1

Widespread frenching appeared in crops of Maryland Medium Broadleaf on a soil neutralized wit lime and heavily dressed with dicalcium phosphate The incidence of frenching reached 100% in th 3rd successive crop, despite high N application although none appeared in the intermediate year i which rainfall was low. No correlation was foun between the degree of frenching and the levels o N, K and P in the soil or in the leaves. Th symptoms were eliminated in subsequent crops b autumn applications of nitrate and sulphur.— U.S.D.A., Beltsville, Md.

901. Sand, S. A.
Weather fleck in shade tobacco as a proble of interaction between genes and environment
Tobacco, N.Y., 1960, **151**(2): 25-35, bibl. 1 illus.

Genetic studies over 5 years have led to the development of fleck-resistant lines which should reduc the incidence of the disorder, although the weathe factor is still paramount. Even in fleck-susceptibl strains young leaves showed considerable resistance but the fleck-resistant strains kept this resistanc longer, and the best of them might maintain i through the critical harvest period. Fleck an rainfall were closely correlated.—Conn. agric. Exp Stat., New Haven.

902. Oka, H., Ohashi, Y., and others.
Studies on the resistance of tobacco to variou diseases. [Japanese, with English summarie to each section.]
Bull. Hatano Tobacco Exp. Stat., 1959, N 44, pp. 1-128, bibls, illus.

This is a series of 8 papers with the followin headings: *Varietal variation of resistance to bacteri wilt in tobacco:* Among 4 strains derive from crosses between Bright Yellow and nativ esistant varieties the lowest percentage of infection as 12·3, whereas 8 of the 20 imported American arieties showed less than 10% and Dixie Bright 44 only 1·3%. *Breeding flue-cured tobacco esistant to bacterial wilt:* Details are given of the rossing of the highly resistant Oxford 26 with etter quality varieties. *Studies on bacterial wilt esistance of tobacco.* I. *Relationship between the ge of the host and resistance:* Resistance in Bright ellow was found to be independent of the age of e plant, but it increased in Dixie Bright 101 as the ge of the plant at the time of inoculation increased. . *Relationship between root injury and bacterial vasion:* The presence of root-knot nematodes creased the susceptibility of Dixie Bright 101 to acterial wilt but not that of Bright Yellow. *tudies on black root-rot resistance of tobacco.* *Varietal variation:* The results of tests on 75 arieties of *N. tabacum* and 2 other *Nicotiana* spp. re given. II. *Relationship between resistance and ge of seedling:* Resistance increased with the age of e seedling at the time of inoculation. III. *ariation in the pathogenicity of Thielaviopsis asicola:* Isolates from the field could be grouped ccording to their ability to infect moderately esistant varieties. *Studies on black shank resisance in tobacco.* 1. *Varietal variation:* Of the 71 arieties and 6 species tested only *N. longiflora* and *. plumbaginifolia* were immune. *Inoculation chniques for evaluating resistance to a necrotic train of cucumber mosaic virus.* I. *Virus concenations in Vinca rosea:* Virus concentrations in *. rosea* inoculated when 40 days old were inversely roportional to the time elapsed following inoculaon. *Varietal variation of resistance to cucumber osaic virus in tobacco:* Low susceptibility to fection was found in 14 varieties. *Studies on e method of testing resistance to wildfire in bacco. Relationship between inoculum concenation and resistance:* The water soaking method f applying inoculum was much more effective in roducing lesions on the varieties under test than e spraying method, a 1 : 1000 dilution in the ormer method being nearly as effective as a 1 : 10 ilution in the latter.

903. TERNOVSKIJ, M. F.
The present stage of progress in the development of tobacco and mahorka varieties immune to diseases and pests. [Russian.]
Tabak, 1960, **21**(3): 49-52.

s a result of extensive studies on tobacco resistance TMV it is claimed that Djubek 7 and 566, Amerian 287 and Trapezond 161 grown in Kazahstan nd Central Asia are immune to the virus. They ere successfully used for the production of Ostrost 2747 and Djubek 03–4–15. It is suggested that e problem of TMV in the U.S.S.R. has been olved. Investigations are also reported on the esistance of varieties and hybrids to various other virus, fungus and bacterial diseases and to broomrape and thrips.

904. KRYLOV, A. V., SMIRNOVA, V. A., AND TARAKANOVA, G. A.
The effect of physiologically active substances on the reproduction of tobacco mosaic virus. [Russian, with English summary $\frac{1}{3}$ p.]
Fiziol. Rast., 1960, **7**: 309-14, bibl. 7, illus.

Applications of 2,4-D, 2,4,5-T, gibberellin or heteroauxin in some cases stimulated, and in others inhibited, the accumulation of TMV in tobacco leaves. The inhibiting action is attributed to an enhancement of the metabolic activity of nucleic acids in the plant, thereby impeding the inclusion of the nucleic acid of the virus in these metabolic processes.

905. SOL, H. H., VAN HEUVEN, J. C., AND SEINHORST, J. W.
Transmission of rattle virus and *Atropa belladonna* mosaic virus by nematodes. [Dutch summary $\frac{1}{2}$ p.]
Tijdschr. PlZiekt., 1960, **66**: 228-31, bibl. 3.

Experiments with tobacco indicated that these viruses are transmitted by nematodes, but that *Hoplolaimus uniformis* or *Hemicycliophora* sp. are probably not the vectors. A footnote states that further experiments by the authors indicate that *Trichodorus pachydermus* is a vector of the rattle virus.—Inst. PlZiekt. Onderz., Wageningen.

906. MARCELLI, E.
Sull'azione antioidica di nuovi fungicidi a base di nitroderivati del fenolo. (**The anti-mildew effects of new nitrophenol fungicides.**)
Tabacco, 1960, **64**: 74-9, bibl. 3.

In greenhouse and field tests with Virginia Bright tobacco for control of powdery mildew [*Erysiphe cichoracearum*] the only one of the nitrophenol derivatives which approached Karathane in effectiveness was nitro-4-nonyl-phenyl-butyrate. The other compounds tested, namely mononitro-2-capryl-phenyl-butyrate, mononitro-2-capryl-phenyl-crotonate and nitro-4-nonyl-phenyl-crotonate (named in ascending order of effectiveness), gave somewhat better results in September than at the higher temperatures of August, and the September results for nitro-4-nonyl-phenyl-butyrate were close to those for Karathane. The products used contained 25% of the active materials and were sprayed as 1% solutions without causing any apparent crop damage.—Ist. sci. sper. Tab., Scafati.

907. GOARIN, P.
Lutte contre l'oïdium du tabac dans la region du Lac Alaotra. (**Control of tobacco mildew in the Lake Alaotra area.**)
Bull. Inst. Rech. agron. Madagascar, 1959, No. 3, pp. 151-3.

Experiments are described, which confirmed the efficiency of 3 sprays of Karathane at 150 g. in 100 l. Karathane dusts were disappointing.

908. Klinkowski, M., and Schmiedeknecht, M.
Der falsche Mehltau des Tabaks, *Peronospora tabacina* Adam, eine für Deutschland bisher unbekannte Tabakkrankheit. (**Blue mould, *Peronospora tabacina*, a tobacco disease hitherto unknown in Germany.**) [Russian and English summaries about 36 lines each.]
NachrBl. dtsch. PflSchDienst, Berlin, 1960, **14**: 61-74, bibl. 217, illus.

A review of world literature.

909. Zogg, H.
Der Blauschimmel des Tabaks, eine neue Krankheit in Europa. (**Blue mould of tobacco, a new disease in Europe.**)
Mitt. schweiz. Landw., 1960, **8**: 136-41, illus.

A devastating outbreak in Switzerland is reported; control measures are being investigated.

910. Wark, D. C., and others.
Differentiation in *Peronospora tabacina* Adam.
Nature, 1960, **187**: 710-11, bibl. 5, illus.

Investigations indicate that at least 3 ecotypes of *Peronospora tabacina* occur in Australia and that the differences between them may be of importance in breeding for disease resistance.—Div. Plant Ind., C.S.I.R.O., Canberra.

911. Racoviță, A.
Influența aplicării unei perioade de secetă asupra răsadului de tutun din soiuri foarte sensibile la *Thielaviopsis basicola.* (**The effect of a period of drought on tobacco varieties that are very susceptible to *Thielaviopsis basicola.***) [French and Russian summaries ¼ p. each.]
Lucr. Inst. Cerc. Alim., 1959, **4**: 203-7, bibl. 2.

The dry rooting-period treatment proposed for the control of black root rot resulted in an increase in the number of healthy or slightly infected plants, but it was too dependent on climatic conditions and the results with highly susceptible varieties were unsatisfactory compared with the usual prophylactic measures.

912. Marcelli, E., and Capozzi, A.
Azione antagonistica del manganese nei riguardi della streptomicina. (**The antagonism of manganese towards streptomycin.**) [English summary 6 lines.]
Tabacco, 1960, **64**: 80-5, bibl. 9, illus.

Tobacco seedlings with their roots immersed in 10^{-3}M streptomycin became chlorotic, but those placed in a mixture of this solution with manganous chloride ($MnCl_2$) at the same concentration remained normal in appearance. After 40 hours the concentration of the antibiotic in the leaves was slightly but significantly higher in the presence than in the absence of the Mn salt. Similar results were obtained by spray application of the solutions to seedlings growing in a greenhouse, but the chlorosis was much slighter at 10^{-4}M of streptomycin than at 10^{-3}M. At the higher concentration some dwarfing occurred. This and the chlorosis were prevented by $MnCl_2$ at 10^{-3}M but not at 10^{-4}M. Slight Mn toxicity resulted from spraying with the higher concentration of the Mn salt alone. Again there was no inhibition by Mn of streptomycin uptake.—Ist. sci. sper. Tab., Scafati.

913. Martin, G. C.
The root-knot nematode in Central Africa.
Span, 1960, **3**: 129-32, bibl. 8, illus.

A survey of species and control methods, notably *Meloidogyne javanica* on tobacco, black wattle and other crops.

914. Nusbaum, C. J.
Soil fumigation for nematode control in flue-cured tobacco. A summary of five years of field work.
Down to Earth, 1960, **16**(1): 15-17, illus.

The acreage of tobacco in North Carolina treated with soil fumigants rose from under 1,000 in 1950 to more than 200,000 in 1956 and 1957. In 216 demonstration plots fumigation gave an average increased return of $137 per acre in the period 1954-59. Because of the interaction between some fumigants and ammonia it is recommended that N should be applied in the form of nitrate.—N.C. St. Coll., Raleigh.

915. Brenière, J.
Les insectes nuisibles au tabac à Madagascar. (**Pests of tobacco in Madagascar.**)
Bull. Inst. Rech. agron. Madagascar, 1959, No. 3, pp. 102-46, bibl. 59, illus.

Ten major pests, including nematodes, and a number of secondary pests are described. There is a calendar of pest control treatments and a key for identification of the pests. Each is fully described with notes on its biology, importance, parasites and means of control.

916. Shanks, C. H., Jr.
Protection of plants from some aphid-transmitted viruses.
Diss. Abstr., 1960, **20**: 3910, being *L.C. Car* *No. Mic.* 60-1018 of 81 pp.

The results are summarized of field and glasshous studies on the use of insecticides and repellents to reduce aphid dissemination of viruses in bean an tobacco crops. In glasshouse tests winged *Myzu persicae* remained longer on parathion and Thime treated tobacco foliage than on untreated foliage whereas DDT had the opposite effect. Sprays o ytovirin resulted in considerable reductions of otato virus Y (PVY) and cucumber mosaic virus CMV) on tobacco when the viruses were mechanially transmitted, but little or no reduction when he viruses were transmitted by aphids. Cytovirin n PVY-infected foliage did not interfere with phid acquisition of the virus. The effectiveness of ytovirin was not increased by wetting agents. richothecin, at 10 or 20 p.p.m., reduced aphidransmitted PVY infections of tobacco by about ne half.—Univ. Wis.

917. BRENIÈRE, J.
Essais d'insecticides à l'égard de *Gonocephalum simplex* Fabr., ténébrionide nuisible au tabac en cours de repiquage à Madagascar. **(Insecticide trials against *Gonocephalum simplex* a tenebrionid pest of tobacco during transplanting in Madagascar.)** [English and Spanish summaries 10 and 11 lines.]
Agron. trop., Paris, 1959, **14**: 459-69.

reliminary soil treatments with 4 insecticides howed that lindane, at rates effective against the eetle, was toxic to the plants, causing a prolonged rowth check. Dieldrin, endrin and aldrin were all qually satisfactory at 0·05 g. of active material er plant. Aldrin was also applied by dipping the oots in the powder or in an aqueous suspension, ut plant injury was evident in both cases.

918. THURSTON, R., AND WADE, C. F.
Phytotoxicity of insecticidal and spray treatments to burley tobacco.
Tobacco, N.Y., 1960, **150**(25): 21-7, bibl. 2, illus.

ccidental spraying with high concentrations of ,4-D can cause the loss of the entire crop, and the se of sprayers contaminated with 2,4-D can cause alformation of leaves. Of the insecticides tested ndane and chlordane were the only ones to cause jury, the former being the more phytotoxic and ersistent. Emulsion concentrates caused some jury, owing to the solvents and emulsifiers, the eavier aromatic solvents being more toxic than the ghter xylene types. Spraying close to the terminal ud caused more damage than spraying 12–15 inches om it.—Univ. Ky, Lexington.

919. RACOVIȚĂ, A.
Răspîndirea lupoaiei ramificate (*Orobanche ramosa* L.) in cultura tutunului din R.P. Romînă. **(The spread of broomrape (*Orobanche ramosa*) in tobacco grown in the Romanian P.R.)** [French and Russian summaries 8 and 10 lines.]
Lucr. Inst. Cerc. Alim., 1959, **4**: 209-14, bibl. 3.

survey in 1957 showed infestation in 7·6% of e tobacco acreage.

920. RACOVIȚĂ, A.
Contribuții la cunoașterea plantelor gazdă și stimulente ale lupoaiei ramificate (*Orobanche ramosa* L.). **(A contribution to the knowledge of host and stimulant plants for broomrape (*Orobanche ramosa*).)** [French and Russian summaries ½ p. each.]
Lucr. Inst. Cerc. Alim., 1959, **4**: 215-21, bibl. 12.

The stimulating effect of the roots of 77 species of plants on broomrape seed was examined, and also its mode of attack on 61 species. Among the stimulants were 7 newly recorded species and among the susceptible plants 14 new species including *Brassica juncea*, *Sinapis alba* and several *Nicotiana* spp.

921. RACOVIȚĂ, A.
Chemical control of the tobacco disease due to *Orobanche ramosa* L. [Romanian?]
Ind. Aliment. Prod. Veg., 1959, **11**: 135-8, from *Tob. Abstr.*, 1960, **4**, Abstr. 725.

Of several chemicals tested Hedolit (based on DNOC) applied at 50 ml. per plant of a 0·5% or, better, a 0·75% solution was most effective, causing the parasite to dry up completely.

Harvesting, curing, fermentation and storage.

(*See also* 18, 174, 898.)

922. BAILOV, D., AND ANDREJČEVA, M.
Eine Farbreaktion zur objektiven Bestimmung der technischen Reife von Tabakblattern. **(A colour reaction for the objective estimation of technical maturity in tobacco leaves.)**
C. R. Acad. bulg. Sci., 1960, **13**: 363-4, bibl. 2.

The colorimetric method described is based not on the intensity of the colour developed but on the time taken for development. Drops of 1 ml. distilled water + 3 drops of tobacco leaf homogenate + 0·5% acetic acid solution were spotted into paraffin rings on filter paper impregnated with guaiacum resin in 96% alcohol. If the characteristic blue colour took 4 minutes to develop the leaf was technically mature, if 4–7 min. it was approaching maturity, if 7–10 min. it could still produce good quality tobacco, but if it took more than 10 min. it meant that the leaf was either green or overmature.

923. TRIFU, I., IOAN, E., AND BERCARU, M.
Recoltarea și uscarea la soare pe plante intregi, aplicată la unele soiuri de tutun cu foaie mijlocie. **(Harvesting on the stalk and sun drying of medium-leaf tobaccos.)** [French and Russian summaries ½ p. each.]
Lucr. Inst. Cerc. Alim., 1959, **4**: 81-96, bibl. 8.

Examination of the yield, quality, composition, fermentation behaviour, combustibility, flavour and costs of production of tobacco from plants harvested whole and from plants harvested leaf by leaf indicated that the former method is to be preferred for sun-dried, medium-leaf, oriental tobaccos.

924. Florencev, E. I.
Experimental prototype machine for field harvesting of tobacco. [Russian.]
Tabak, 1960, **21**(3): 48-9, illus.

A machine, similar to one already tested in North Carolina in 1954, was constructed at the Kuban Agricultural Institute. As 5·6–8·2% of the total leaves harvested were damaged, further investigation must be carried out with particular reference to the cutting mechanism.

925. Leonov, I. P.
Some results of trials with a pneumatic conveyor on an experimental tobacco harvesting machine. [Russian.]
Tabak, 1960, **21**(3): 47-8.

A pneumatic conveyor is briefly described, by means of which the cut leaves are carried by the air flow into storage compartments. Field trials showed the device to be promising but indicated the need for certain improvements.

926. Barat, H., and Baudin, P.
Pourriture des feuilles de tabac au séchoir. **(Leaf rot of tobacco in the curing barn.)**
Bull. Inst. Rech. agron. Madagascar, 1959, No. 3, pp. 147-50, bibl. 2, illus.

The symptoms of leaf rot are described. *Rhizopus nigricans* is the causal agent but its etiology is not clear. Improvements in drying conditions, which can control the disease, are not easy to obtain in Madagascar, but the predisposition of the leaf to rotting can be reduced by improved cultural conditions.

927. Ležanin, N. I.
How we carry out tobacco curing in standard bales prior to fermentation. [Russian.]
Tabak, 1960, **21**(3): 30-2, illus.

A new press for compressing tobacco into standard bales is briefly described. The press has proved very cheap to produce and is being used on an increasing scale in the Alma-Ata district.

928. Asmaev, P. G.
A new fermentation regime for cigarette tobacco. [Russian.]
Tabak, 1960, **21**(2): 43-6, bibl. 7.

Fermentation at 50° C. was compared with a 2-stage method in which temperatures of 50° and then 35° C. were used. High quality leaf was heated rapidly to 50° C. by raising the air temperature in the chamber to 60–65° C. for 24–30 hours. The temperature was then reduced to 35° C. over 24–30 hours and held at this level for 7–8 days, the humidity being maintained at 60–65%. When the oxygen index reached 0·10, the chamber was cooled down and the tobacco removed. With coarser leaf the procedure was similar but the initial higher temperature was maintained for an additional 24 hours. The new method resulted in a better quality product.

929. Grebeškov, I. S., and Slivinskij, A. V.
Further views on the complex system involving automatic control of a predetermined fermentation regime of tobacco. [Russian.]
Tabak, 1960, **21**(3): 29-30.

A brief exposition is given of two conflicting opinions on the use of automatic ventilation during the combined regime of tobacco fermentation. The authors emphasize that the opinion of A. M. Kelleev, who denounces automatic ventilation during the third phase of fermentation, is proved wrong by I. S. Kogan, whose method of completely automatic regulation of the ventilation during the whole of the fermentation process has been successfully applied in Moldavia [see *H.A.*, 30: 897].

930. Nikitenko, Ju. R., and Apozjanc, S. A.
A trial of tobacco fermentation by the combined regime. [Russian.]
Tabak, 1960, **21**(3): 27-9.

Results of two years' trials, in which tobacco bales were fermented by a method similar to that described earlier [see *H.A.*, 29: 2650], showed improved quality and a reduction in steam used per ton of tobacco, viz. 310-330 kg. when the combined system was employed, compared with 330–350 kg. in fermentation at 50° C.

931. Borodjanskij, V. P.
Changes in the internal pressure in the bales during the process of their fixation after pressing. [Russian.]
Tabak, 1960, **21**(3): 32-5.

The internal pressure in tobacco bales which develops during their compression decreases markedly during the first stage after the bales have been fixed [held between plates with clamps]. The bales must not be fixed until 6 hours after the completion of pressing. Fixation of the bales after their second pressing should last longer than the fixation of bales that have been pressed for the first time.

932. Trubnikov, V. F.
On the fall of temperature and relative humidity of the air in the fermentation chambers. [Russian.]
Tabak, 1960, **21**(3): 39-41, bibl. 4.

Observations made during tobacco fermentation established that the maximum fall in the R.H. in the chambers reached 60%. Its mean value fluctuated between 17 and 46% during 50° C. fermentation and between 31 and 50% during the combined regime. The fall of R.H. is particularly large in the third phase of fermentation. Use of dryin apparatus in the chambers is not recommended.

933. ASMAEV, P. G., AND MOHNAČEV, I. G.
Concerning the contents of carbonyl substances of a non-carbohydrate nature in tobacco. [Russian.]
Tabak, 1960, **21**(3): 35-9, bibl. 10.

In experiments with different temperature regimes for tobacco fermentation a low temperature regime (30–35° C.) favoured the development of a higher concentration of non-carbohydrate carbonyl substances than a higher temperature regime (50–70° C.).

934. TRIFU, I., AND MIHAILOVICI, I.
Grăbirea fermentării prin tratarea tutunului cu vapori de apă în vid cu și fără oxid de etilen. (**The acceleration of tobacco fermentation by treatment with water vapour under reduced pressure, with or without ethylene oxide.**) [French and Russian summaries ½ p. and ½ p.]
Lucr. Inst. Cerc. Alim., 1959, **4**: 63-72, bibl. 17.

No appreciable differences were observed in the inal product when bright oriental leaf was ermented in the normal way, pre-treated with thylene oxide and oxygen, or exposed to water vapour under reduced pressure. The third treatment is considered the most effective for reducing he time taken to complete fermentation.

935. GHEIKING, A., AND BERCARU, M.
Corectarea tutunurilor mucegăite. (**Recovery of musty tobaccos.**) [French and Russian summaries ¼ p. each.]
Lucr. Inst. Cerc. Alim., 1959, **4**: 73-9, bibl. 4.

By exposure to steam at a pressure of 2 atm. for 15–30 min., making sure 100° C. is attained throughout the mass.

936. ETHELSTON, J. D.
Tobacco moth can be controlled on farms in Western Province.
Fmg S. Afr., 1960, **36**(4): 23-6, illus.

Fumigation experiments carried out on 3 farms using 2 lb. purified methyl bromide per 1,000 cu. ft. have been almost 100% effective against *Ephestia elutella* in stored tobacco. To prevent further infestation in the store rooms the application of 2·5% pyrethrum, dissolved in a light odourless mineral oil, is recommended as a space spray. The rooms should be sprayed twice a week using ¼ pint of spray per 15,000 cu. ft. Once the tobacco crops have been removed the walls, ceilings and floors should be thoroughly cleaned and sprayed with DDT, malathion or lindane.—Div. Ent., Rosebank.

937. YAMAMOTO, R. T., AND FRAENKEL, G.
The suitability of tobaccos for the growth of cigarette beetle, *Lasioderma serricorne*.
J. econ. Ent., 1960, **53**: 381-4, bibl. 13.

Cigarette beetles developed well on flue-cured tobacco, very slowly and with high mortality on Turkish and Maryland tobaccos and not at all on burley tobacco, thereby indicating that only flue-cured tobacco would be highly susceptible to infestation.—Univ. Ill., Urbana.

MISCELLANEOUS TEMPERATE AND TROPICAL PLANTS.

Condiment and spice plants.

(*See also* 776, 780-782, 977-979, 1675.)

938. MOSCHINI, E.
La coltivazione del dill (*Anethum graveolens* L.). (**Dill culture.**)
Riv. Ortoflorofruttic. ital., 1960, **44**: 24-31, illus.

n Italy dill is cultivated in the Albenga district ither in cold greenhouses in winter in alternation vith tomatoes or in the open under olive trees. Notes are given on cultural methods, spacing, ertilization and yields.

939. JANKULOV, I. K.
On the phase of development at which caraway (*Carum carvi*) is vernalized. [Russian, with French summary ½ p.]
C. R. Acad. bulg. Sci., 1960, **13**: 219-22, bibl. 2.

Vernalization occurs in caraway in the rosette stage hen it has 5 well developed leaves and the roots weigh not less than 0·310–0·380 g. For plants to each this stage on the Samokov plain in Bulgaria eeds should be sown not later than 20 July.

940. ENDO, R. M., AND LINN, M. B.
The white-rust disease of horseradish.
Bull. Univ. Ill. agric. Exp. Stat. **655**, 1960, pp. 56, bibl. 22, illus.

The life history of the pathogen *Albugo candida* and the symptoms of the disease are described in detail. The recommended control measures are: taking sets only from the terminal end of the primary root immediately after harvesting; elimination before planting of all sets with discoloured, swollen or cracked lesions; immediate removal of plants showing infection in the spring and summer; and killing the foliage mechanically at least 7 days before harvest to reduce the risk of viable conidia contaminating the roots before storage.

941. GILLOT, J., AND VAN DINGENEN, A.
Observations sur la multiplication végétative du poivrier (*Piper nigrum*). (**Observations on the vegetative multiplication of black pepper.**)
Bull. Inf. I.N.É.A.C., 1960, **9**: 115-28, illus.

To raise seedlings the seed should be soaked (unless it is fresh), sown on the surface of fermented sawdust and then lightly covered with sawdust after a fortnight. The seedlings should be transplanted at an early stage into baskets and should be planted under shade after several months more in the nursery. In vegetative multiplication semi-hardwood cuttings are taken when the plant is well supplied with nutrient reserves. Orthotropic cuttings (from the main stem) may consist of a single node and the basal internode, of 2 nodes or of a plagiotropic internode on an orthotropic node. Plagiotropic cuttings (from side branches) consist of 2 nodes and an internode, with or without an orthotropic heel. Plagiotropic cuttings with an orthotropic heel are the best propagating material, giving vigorous, productive plants, resistant to *Rhizoctonia* in youth.

942. SEBASTINE, K. M.
A note on *Piper schimidtii* Hook. F. of the Pakasura hills.
South Indian Hort., 1958, **6**: 36-8, bibl. 3, illus.

Grows wild at higher altitudes than are suitable for *P. nigrum* and is used locally as a condiment.

943. NEVSTRUEVA, R. I., AND OSIPOVA, E. A.
Development of flower buds of the muscatel sage. [Russian.]
Agrobiologija, 1960, No. 2, p. 302.

Vernalization in *Salvia sclarea* takes place at temperatures of 0–10° C., and by the end of May the reproductive organs are clearly visible even in the lower floral positions.

944. BARAT, H.
Tendances actuelles dans l'étude des moyens de lutte contre la fusariose de vanillier. (**Present trends in the study of means of controlling *Fusarium* disease of vanilla.**)
Bull. Inst. Rech. agron. Madagascar, 1959, No. 3, pp. 86-8, illus.

Various ecological aspects of the disease are discussed; improved cultural conditions and a reduction in nematode populations may help to reduce its incidence.

945. MARIAKULANDAI, A., RADHAKRISHNAN, T., AND KRISHNAMURTHY, S. R.
A note on vanilla extract from vanilla grown on the Nilgiris.
South Indian Hort., 1958, **6**: 78-80.

With a brief chemical analysis.

Drug plants.

946. KUM-TATT, L.
Quantitative isolation of alkaloids from plant materials.
Nature, 1960, **188**: 65-6, bibl. 3.

Details are given of procedures for the isolation of opium alkaloids and the quantitative determination of papaverine in opium, and also for the isolation of strychnine and brucine from nux vomica.—Dep. Chem., Govt Singapore.

947. BOSE, B. C., AND OTHERS.
Some aspects of chemical and pharmacological studies of *Acorus calamus* Linn.
J. Amer. pharm. Ass., sci. Ed., 1960, **49**: 32-4, bibl. 4.

Chemical analysis of powdered rhizomes and roots of *A. calamus* showed the presence of reducing sugars, tannins, resins, sterol, 1·5% essential oil, 0·4% K and 0·6% Ca. The plant is used in India as a remedy for asthma; other medical aspects are discussed.—M.G.M. med. Coll., Indore, India.

948. SHARMA, A. K., AND BAL, A. K.
A comparative effect of the bark extract of two members of the Apocynaceae on plant tissue.
Portugal. Acta biol., 1959, **6**: 45-64, bibl. 14, illus.

Tumours were produced on the roots of garlic after treatment for 24-72 hours with extracts from the bark of *Alstonia scholaris*, which contains the alkaloid ditamine. In some resting nuclei a polyploid condition was induced. Longer treatment proved lethal to the meristematic cells. Extracts from the bark of *Holarrhena antidysenterica*, containing kurchicine, were highly toxic, agglutinating the chromatin of the nuclei. The commercial drug 'Kurchisol' gave similar results.—Bot. Dep., Calcutta Univ.

949. DELTCHEV, G.
Quelle est la place de l'accumulation maximum des alcaloïdes dans les feuilles de l'*Atropa belladonna* L.? (**The location of maximum alkaloid accumulation in *Atropa belladonna* leaves.**)
C.R. Acad. bulg. Sci., 1960, **13**: 355-8, bibl. 5, illus.

The alkaloid content increased from the lower to the upper leaves and from the base to the apex of the individual leaves.

950. FLETCHER, G.
The anti-N phytagglutinin of *Bauhinia variegata.*
Aust. J. Sci., 1959, **22**: 167-8, bibl. 6.

B. variegata seeds have proved a cheap source o a reliable anti-N agglutinin; details of extractio are given.

951. ROSCOE, C. W., AND HALL, N. A.
A preliminary study of the alkaloidal principl of *Ceanothus americanus* and *Ceanothu velutinus.*
J. Amer. pharm. Ass., sci. Ed., 1960, 4 108-12, bibl. 16.

The root barks contained a complex mixture alkaloids, on which preliminary fractionation studi are reported.

52. Černobaj, V. T., and Kolesnikov, D. G.
The coumarins of *Cnidium dubium* (Schkuhr.) Thell. [Russian.]
Doklady Akad. Nauk S.S.S.R., 1960, **133**: 233-5, bibl. 6.

oumarins isolated from the fruits of *Cnidium* *bium* were called cnidin, cnidicin and cnidilin; the tter compound possessed antispasmodic activity.

53. Battersby, A. R., and Reynolds, J. J.
Biosynthesis of colchicine.
Proc. chem. Soc., Lond., 1960, pp. 346-7, bibl. 12.

abelled tyrosine and acetate were fed to growing *olchicum autumnale* plants and the colchicine was olated. The latter contained 0·23% and 0·13% dioactive incorporations, respectively. The emical nature of the synthesis is discussed.—ristol Univ.

54. Brummett, R. E., and Sciuchetti, L. A.
Changes induced by gibberellic acid on growth and alkaloid patterns in *Datura stramonium* Linné and in *Atropa belladonna* Linné.
J. Amer. pharm. Ass., sci. Ed., 1960, **49**: 274-7, bibl. 8.

ibberellic acid was applied as single 100 mcg. oses to the surface of the youngest unfolding af. Only slight changes in the total dry weight ere induced in *D. stramonium*, but root growth was creased by up to 80%. In belladonna the total dry eight of the younger plants was reduced by about 0%, while that of the older plants was increased y about 48%. The concentration of alkaloids in e organs of each species was generally reduced. otal alkaloid production in treated stramonium as somewhat less than that in the controls, but total oot alkaloids were increased by about 50%. At the xth week following treatment the younger bella-onna plants produced about 40% less total alka-oids than the controls, whereas older plants roduced about 30% more than the controls. [From uthors' summary.]—Ore. St. Coll., Corvallis.

955. Maciejewska-Potapczyk, W.
Phosphorus compounds, nuclease, and phosphatase activities in healthy and tumorous stem tissues of *Datura stramonium* L.
J. exp. Bot., 1960, **11**: 98-103, bibl. 14.

he very high level of P in the tumours resulted om increased amounts of acid-soluble phosphorus, pid-phosphorus, ribonucleic acid phosphorus and eoxyribonucleic acid phosphorus. The activities f ribonuclease, deoxyribonuclease, and glycero-hosphatase were all considerably higher in the mours than in the stem tissue. [From author's mmary.]—Rothamsted exp. Stat.

956. Gregory, H., and Leete, E.
Biogenesis of digitoxigenin.
Chem. Ind. Lond., 1960, No. 40, pp. 1242-3, bibl. 6.

Tracer studies at the University of Minnesota, in which DL-mevalonic acid-2-^{14}C and sodium acetate-1-^{14}C were fed to plants of *Digitalis purpurea* and *D. mertonensis*.

957. Fuchs, L., Wichtl, M., and Jachs, H.
***Digitalis* glycosides. IV. Influence of drying temperature on glycoside composition in *Digitalis* leaves (*D. purpurea* and *D. lanata*).** [German ?]
Arch. Pharm., Berl., 1960, **293**: 414-21, bibl. 22, from abstr. in *J. appl. Chem.*, 1960, **10**: ii-279.

The results of comparative drying at temperatures ranging from 20° to 100° C. are evaluated chromatographically. The primary glycosides are best conserved by drying on racks at room temperature. The time taken to dry leaves gathered in dry weather is 11 days; the drying of wet leaves should be accelerated by use of warm air at not more than 40° C. Considerable losses of primary, and gains in secondary, glycosides are incurred on drying at more than 55° C.

958. Kostołowska, M.
Ocena wartości leczniczej kłacza paprotnika samczego (*Dryopteris filix-mas* (L.) Schott) Pochodzenia krajowego oraz preparatów z niego sporzadzonych. (**An evaluation of the therapeutic value of the roots of *Dryopteris filix-mas* of Polish origin and of preparations made from them.**) [English and Russian summaries.]
Diss. Pharm., 1959, **11**: 355-68, from *Biol. Abstr., Sect. D*, 1960, **35**, Abstr. 39,413.

The raw material was found to contain 4% of crude filicin and to be highly toxic. The harvesting season had no effect on its biological value. It was found necessary to dry the crop immediately after harvesting. Subsequent storage also affected its quality. —Cracow Acad. Med., Poland.

959. Vishin, M. L., and others.
Biosynthesis of damascenine in *Nigella damascena* L.
Nature, 1960, **188**: 61-2, bibl. 2.

Experiments are described which showed that the leaves are capable of synthesizing the alkaloid, which occurs in the highest concentration (0·1–0·3%) in the seeds and in particular in the testas.—Martin-Luther-Univ. and German Acad. Sci., Halle/Saale.

960. Esdorn, I.
Die Ginsengwurzel auf dem heutigen Drogenmarkt. (**Ginseng roots on today's drug market.**)
Pharmazie, 1960, **15**: 75-81, bibl. 29, illus.

Ginseng roots of commerce in their very various forms do not differ anatomically or morphologically in their characteristics according to their place of origin with the exception of the red ginseng which at present comes only from eastern Asia. It is thought that differences observed by some workers between specimens from eastern Asia and from America are probably due to differences in age and not species. This supposition would tally with the opinion of some systematists that *Panax ginseng* is only a variety of *Panax quinquefolius*.

961. STATENS FORSØGSVIRKSOMHED I PLANTEKULTUR.
Forsøg med sorter af opiatvalmue 1948-1958. **(Opium poppy variety trials, 1948-1958.)**
Tidsskr. Planteavl, 1960, **64**: 161-2.

Three varieties compared in 4 areas.

962. KOPP, E., KOTILLA, E., AND CSEDÖ, K.
Mikrochemische Bestimmung des Morphingehalts reifer Mohnkapseln mittels einer nephelometrischen Methode. (**Microchemical determination of the morphine content of ripe poppy capsules by means of a nephelometric method.**)
Pharmazie, 1959, **14**: 263-5, from *Biol. Abstr., Sect. D.*, 1960, **35**, Abstr. 39,412.

This method measures the turbidity produced on adding ammonium molybdate and vanadate. It is not very accurate but, being simple and speedy, is suitable for selecting alkaloid-rich strains in breeding work, etc.—Med. Pharm. Inst., Tirgu Mures, Romania.

963. ZAJCEVA, A. A.
The mechanism of morphine accumulation in the opium poppy (*Papaver somniferum* L.) and the role of the latex system. [Russian, with English summary 6 lines.]
Bot. Žurnal, 1959, **44**: 1567-77, bibl. 32.

Alkaloids are not synthesized in the laticiferous tubes of the opium poppy but are collected in them in various quantities from the surrounding active tissues.

964. BATTERSBY, A. R., AND BINKS, R.
Biosynthesis of morphine: formation of morphine from norlaudanosoline.
Proc. chem. Soc., Lond., 1960, pp. 360-1, bibl. 12.

An intermediate stage in the biosynthesis from tyrosine [see *H.A.*, **28**: 3867] elucidated, in opium poppy plants.

965. MAAS GEESTERANUS, H. P.
Pyrenophora calvescens op blauwmaanzaad. (***Pyrenophora calvescens* on seeds of opium poppy.**) [English summary ½ p.]
Tijdschr. PlZiekt., 1960, **66**: 237-48, bibl. 15, illus.

Pyrenophora calvescens is not considered to be a parasite, because it only attacks dying tissues. The main infection occurs after the crop is cut when weather conditions are bad for drying. The outer tissues of seedling hypocotyls may be attacked, but only if bacteria are also present. The reduction of infection by seed treatment is apt to be onl temporary.—I.P.O., Wageningen.

966. GOTTLIEB, O. R., AND MORS, W. B.
Sôbre a ocorrência da 5,6-dehidrocavaina n raiz de cava. (**The occurrence of 5,6-dehydro kavaine in kava root.**)
An. Acad. brasil. Ciên., 1959, **31**: 407-9, bib 9.

Composition of a drug in kava root, *Piper methy sticum.*

967. RABINOVIČ, I. M.
Regarding the introduction of *Rauwolfi serpentina*. [Russian.]
Bot. Žurnal, 1960, **45**: 592-5, bibl. 4, illus.

Cultural trials have indicated that *R. serpentin* can be grown in the humid subtropics of Trans caucasia.

968. JOINT COMMITTEE OF THE PHARMACEUTICA SOCIETY AND THE SOCIETY FOR ANALYTICA CHEMISTRY.
Assay of rauwolfia.
Analyst, 1960, **85**: 755-64, bibl. 23.

The method of Banes *et al.* (*J. Amer. pharm. Ass sci. Ed.*, 1956, **45**: 200) for determining reserpin and similar alkaloids in rauwolfia is recommende with certain modifications.

969. WORKMAN, R. L., JR., AND HINER, L. D.
Comprehensive studies on Utah-grown medi cinal rhubarb.
J. Amer. pharm. Ass., sci. Ed., 1960, **49** 118-20, bibl. 10.

See *H.A.*, 30: 910.

970. LARUELLE, R.
L'amélioration de la culture de la valérian officinale en Belgique. (**Improvement in th production of valerian in Belgium.**)
Ann. Gembloux, 1959, **65**: 44-57, bibl. 7.

The present system of cultivating valerian i Belgium, based on *V. officinalis* and *V. sambucifoli* and carried out as a family concern on antiqu principles, is described. Attempts are being mad to evolve better material and improve cultivatio and extraction methods. The aim of breeding i to produce varieties which show (1) increase yields, (2) high essential oil content and (3) mildev resistance. Other work anticipated concerns densit of planting, time of planting, weeding versu mounding up, time of sowing seed in relation t date of harvesting seed, storing seed and the bes temperature for drying roots.

971. HÁJKOVÁ, I., HOMOLA, V., AND NAVRÁTIL, L
Bestimmung einiger Inhaltsstoffe von *Vinc minor* L. während der Vegetationszeit. (**De termination of several constituents of *Vinc minor* during the vegetative period.**)
Pharmazie, 1959, **14**: 537-40, bibl. 17, fron *Biol. Abstr., Sect. D*, 1960, 35, Abstr. 30,429

he highest alkaloid (1·16%) and ursolic acid ·01%) contents were found in the autumn, and e lowest during the winter. Yields of rubber were reatest in the spring (2·21%) and lowest in the inter.

Essential oils.

972. Anon.
Exports of essential oils from the British Colonies for the years 1953-58. Exports of essential oils from the Commonwealth countries for the years 1953-58.
Trop. Sci., 1960, **2**: 99-102, bibl. 5.

uantities and values tabulated.

973. Hiraizumi, T.
Essential oils and synthetic perfumes in Japan.
Perfum. essent. Oil Rec., 1959, **50**: 483-5, 585-91, illus.

he production of camphor and camphor oil *Cinnamomum camphora*) and of Japanese mint oil *Mentha arvensis* var. *piperascens*) are described in ome detail. Short notes are also provided on the roperties of essential oils from *Chamaecyparis btusa*, *Thujopsis dolabrata*, *Cryptomeria japonica*, *bies sachalinensis* and *A. mayriana*, sweet orange *Citrus aurantium* var. *natsudaidai*) and mikan (*C. nshiu*).—Takasago Perfum. Co., Tokyo.

974. Hotin, A. A.
Harvesting coriander. [Russian.]
Zemledelie, 1960, **8**(6): 48-54.

eed and essential oil yields were higher, and uality was better, when coriander was threshed bout a week after cutting than when it was ombine-harvested. Cutting should start when e seeds in 20–25% of the umbels are ripe and ave a moisture content of 45–50%, and be nished 5–6 days later when the seeds in 50–60% f the umbels are ripe and have a moisture content f 25–30%. Crop left standing after this period hould be harvested with the combine.

975. Fernandes Costa, A., Cardoso do Vale, J., and Maia e Vale, M. A.
Contributions to the study of the aromatic plants of Portugal. The microscopical characteristics of the fruit of the fennel.
Perfum. essent. Oil Rec., 1959, **50**: 487-93, bibl. 14, illus.

detailed anatomical study of the achenes of *oeniculum vulgare*. [For details of their oil see .A., 30: 5749.]

976. Fröhlich, G.
Zur Lebensweise und Bekämpfung der an Fenchel (*Foeniculum vulgare* Miller) schädigenden Blindwanzen *Lygus campestris* L. und *L. kalmi* L. (**Life histories and control of *Lygus campestris* and *L. kalmi* on fennel.**)
Pharmazie, 1960, **15**: 334-41, bibl. 8, illus.

While attempts to determine the ideal methods of control failed for want of pests, it is concluded that the use of BHC, DDT or a combination of the two materials in powder or liquid form just before blossoming will be efficacious, and that umbelliferous weeds should be eradicated from the vicinity of fennel crops.

977. Kančaveli, G. I.
The biology of the bay laurel in the humid and dry subtropics of the U.S.S.R. [Russian.]
Subtrop. Kul'tury, 1959, No. 3, pp. 69-80, illus.

Laurus nobilis vars *latifolia*, *latifolia undulata*, *lanceolata* and *microphylla* grown for their leaves.

978. Čhaidze, I. I., and Kvačantiradze, A. H.
Growing planting material of bay laurel. [Russian, with English summary ¼ p.]
Subtrop. Kul'tury, 1959, No. 2, pp. 44-8, illus.

Growing seedlings *in situ*, transplanting seedlings, grafting and layering have all proved satisfactory methods of propagating bay laurel. The vegetative methods are preferable for producing uniform stands of high yielding, good quality trees.

979. Vološin, M. P.
Growth characteristics of the aerial parts of bay laurel in the Crimea. [Russian, with English summary 8 lines.]
Subtrop. Kul'tury, 1959, No. 2, pp. 49-52.

Pruning should be very light, heavy pruning being reserved for the rejuvenation of old trees.

980. Kopp, E., and others.
Über das rumänische Lavandinöl. (**Romanian lavender oil.**)
Pharmazie, 1960, **15**: 126-30, bibl. 10.

Lavender grown for extraction in Romania would appear to be more akin to so-called English lavender (*Lavandula hybrida*) than to French lavender (*L. officinalis*). It grows extremely freely in Romania and has no important pests or diseases. Notes are given on harvesting and distilling. The crop, under experimental conditions, was 2,100 kg. lavender heads per ha., yielding 51·8 kg. oil. The quality of the oil is said to be better than English but not so good as French.

981. Dimitrova, E.
Une nouvelle forme de *Lavandula vera* L. (**A new form of *Lavandula vera*.**)
C.R. Acad. bulg. Sci., 1960, **13**: 347-50, bibl. 3, illus.

A form of *Lavandula vera* was found, which flowered twice in a season. The double flowering tendency was transmitted to the progeny, but the quantity of secondary flowers varied with external conditions. The percentage of essential oil and linalyl acetate in the second crop was similar to that in the first crop.

982. PETTINATO, F. A., FISCHER, L., AND HALL, N. A.
An analysis of the volatile oil of *Lomatium suksdorfii*.
J. Amer. pharm. Ass., sci. Ed., 1960, **49**: 45-8, bibl. 15.

The aqueous portion of the steam distillate from the fruits contained acetic, isovaleric, propionic and butyric acids. The volatile oil consisted of over 90% terpene hydrocarbons, notably *d*-β-phellandrene and *d*-limonene.—Univ. Wash., Seattle.

983. ZOLOTOVITCH, G.
Un spot test de couleur de l'essence de menthe pour la sélection de la menthe. **(A colour spot test on mint oil for use in mint selection.)**
C.R. Acad. bulg. Sci., 1960, **13**: 343-6, bibl. 2.

By adding nitric acid to acetic acid a blue colour specific to *M. piperita* is obtained.

984. IKEDA, N., SHIMIZU, S., AND UDO, S.
Studies on the induced tetraploid and triploid clones of *Mentha rotundifolia* (L.) Hud. [Japanese, with English summary ½ p.]
Sci. Reps Fac. Agric. Okayama Univ., 1960, No. 15, pp. 1-9, bibl. 7, illus.

The tetraploid clones produced by colchicine treatment of a diploid clone and the triploid clones obtained by crossing these two types were larger, flowered later in the season and contained a higher rotundifolone content than the parent diploid clone. The reduction in pollen fertility and percentage of seed set was slight in the tetraploids but very marked in the triploids.

985. ADMIRAL'SKAJA, S. A.
Fertilization, embryo and endosperm development in the allopolyploid form of *Mentha piperita* L. [Russian.]
Doklady Akad. Nauk S.S.S.R., 1960, **130**: 919-21, bibl. 5, illus.

Described and illustrated with drawings from microscopical preparations.

986. RINNE, R. W., AND LANGSTON, R. [G.]
Effect of growth on redistribution of some mineral elements in peppermint.
Plant Physiol., 1960, **35**: 210-15, bibl. 14, illus.

The distribution of 5 elements was studied in peppermint cuttings by radioautographic techniques. In the older mature leaves Ca was immobile, but in other parts there was an upward, but very little downward, translocation. Movement of S occurred in both directions, and accumulation was fairly even in the leaf mesophyll. Accumulation of Zn occurred in stems, petioles and leaf veins, and there was redistribution throughout the plant. With Cl, redistribution was downwards, and unlike Ca, S and Zn this element was not immobilized in the older leaves. Accumulation of Co occurred only in the leaf tips and margins, and there was complete mobility of the element within the plant.—Purdue Univ., Lafayette, Ind.

987. RINNE, R. W., AND LANGSTON, R. G.
Studies on lateral movement of phosphorus 32 in peppermint.
Plant Physiol., 1960, **35**: 216-19, bibl. 9, illus.

The radioactive P was supplied to ½ or ¼ of the root system of peppermint cuttings, and its translocation was shown by radioautography to be almost completely confined to the 1 or 2 corresponding quarters of the vascular system of the shoot, with practically no lateral movement. As the 2 halves of each leaf derive their sap supply from 2 distinct stem bundles, no whole leaves appeared in the radioautographs of cuttings under the ¼-root treatment.—Purdue Univ., Lafayette, Ind.

988. OGZEWALLA, C. D.
Effects of gibberellic acid on *Mentha piperita*.
Diss. Abstr., 1960, **20**: 4085, being *L.C. Card No. Mic.* 59-6533 of 71 pp.

In plants sprayed weekly with 10 and 100 p.p.m. of GA the fresh weight yield of peppermint herb was reduced, but the dry weight yield of peppermint was similar to that of control plants sprayed with water. After harvest a second crop of mint was grown without further GA treatment. In this case the yield of oil was reduced on both a fresh and dry weight basis in the plots previously treated with GA. The powdered herb from GA-treated plants was indistinguishable from that of the controls. Oil from the GA-treated plants was not up to U.S.P. specifications.

989. MOLNÁR, G., FARKAS, G., AND KIRÁLY, Z.
Védekezési kisérletek mentarozsda (*Puccinia menthae* Pers.) ellen nikkel-sókkal. **(Control of mint rust (*Puccinia menthae*) by nickel salts.)** [English, Russian and German summaries 10-12 lines each.]
Növénytermelés, 1960, **9**: 175-80, bibl. 13.

Spraying with 0·1, 0·2 or 0·3% nickel chloride or nickel nitrate gave effective control of mint rust or peppermint and increased both leaf and essentia oil yields. $NiCl_2$ had no effect on the menthol con tent of the oil, but $Ni(NO_3)_2$ reduced it by 15%.

990. GORDEE, R. S., PORTER, C. L., AN LANGSTON, R. G.
Uptake and distribution studies of cadmium 115-m in peppermint.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 525-8 bibl. 3, illus.

It had previously been found that cadmium had a inhibiting effect *in vitro* on spore germination an sclerotia production of *Verticillium albo-atrum* Autoradiographic studies were therefore unde taken on the uptake and accumulation of Cd i e host plant, *Mentha piperita*. No accumulation f Cd^{115m} occurred until the plants had been exposed or 24 hours. After 72 hours of uptake, accumula- on was observed mainly in the vascular tissue of e plant. This is precisely where Cd would be equired, if it were to be successfully used as an hibitory agent against verticillium wilt. The stem ontained the greatest accumulation, with petioles, eins and inter-veinal tissues showing lesser mounts. Accumulation was greatest in the lower aves of the plant. Translocation of Cd^{115m} into ewer growth was observed. Only small amounts ccumulated in the mesophyll, which indicated at Cd remains largely in the vascular tissues of e plant. Increased accumulation observed after 4 days' growth following leaching indicated that is element is not eliminated by the plant.—Purdue niv., Lafayette, Ind.

991. LAUGHLIN, W. M.
A study of the physical and chemical properties of Michigan peppermint oil.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **42**: 787-93, bibl. 13.

easurements of (1) specific gravity, (2) optical otation, (3) refractive index, and the contents of 4) free esters, (5) menthol and (6) menthone in eppermint oil at the beginning and end of 2 seasons owed that (2) (4) and (5) increased and (6) ecreased with increased maturity of the plant. ifferences were also noted between the 2 seasons aused by different climatic conditions.

992. BLAKE, M. I.
The quantitative determination of free menthol in peppermint oil.
J. Amer. pharm. Ass., sci. Ed., 1960, **49**: 175-7, bibl. 9.

y acylation with chloroacetyl chloride.

993. MOSCHINI, E.
La coltivazione del basilico (*Ocimum basilicum* L.). (**The cultivation of basil (*Ocimum basilicum*).**)
Riv. Ortoflorofruttic. ital., 1960, **44**: 249-59, illus.

escriptions of species and varieties, uses, cultural etails for growing in the open and under glass, ixed cropping, harvesting and yields.

994. YOSHIDA, T.
Physiological and ecological studies on the secretion of essential oil in *Pelargonium* species. VII. Seasonal fluctuations in the percentage oil yield and factors affecting them. VIII. Factors affecting daily fluctuations in the percentage oil yield and the nature of the fluctuations on two successive days. [Japanese, with English summary.]
Proc. Crop Sci. Soc. Japan, 1959, **28**: 228-32, illus., from *Biol. Abstr., Sect. D*, 1960, **35**, Abstr. 30,151.

Trials over 2 years with *P. roseum*, variety France, showed that air temperature was the major environmental factor controlling the percentage of oil, especially in the younger leaves. The oil percentage was higher in October and November than in May and June owing to secondary factors of humidity, rainfall and sunshine. There was a parabolic relationship between a rise in air temperature and oil percentage, with a maximum yield occurring at a temperature of 28 to 29° C. at 9 a.m. With increased sunshine the oil percentage in young leaves increased by as much as 50 to 60, but very little increase was found in older leaves.—Coll. Agric., Ehime Univ.

995. MATTHEWS, W. S., AND PICKERING, G. B.
Patchouli from the Seychelles.
Trop. Sci., 1960, **2**: 93-5.

Oil distilled from the dried leaves of plants grown from cuttings imported from Singapore differed from the East Indian type. This may have been due to differences in cultivation methods, time of harvesting, climate or soil conditions.

996. MCGIMPSEY, J. R., AND MURRAY, J.
Essential oils of New Zealand Podocarpaceae. II. *Podocarpus spicatus*.
J. appl. Chem., 1960, **10**: 340-4, bibl. 18.

Compounds identified in samples of oil from different parts of New Zealand.

997. INFORZATO, R., AND PINTO, A. J. d'A.
Sistema radicular do vetiver (*Vetiveria zizanioides* Nash). (**The root system of vetiver.**) [English summary 6 lines.]
Bragantia, 1959, **18**: 337-41, bibl. 1, illus.

In trials on terra-roxa-mistadura soil the closest of 4 spacings, viz. 90 × 30 cm., gave the highest root yield, and planting on level soil outyielded ridge planting. The highest yield, 9619 kg. roots per ha., was obtained from planting on level soil at 90 × 30 cm. Of the total root weight 88%was found in the upper 30 cm. of the soil and virtually 100% within 50 cm. of the surface.

Fibres.

998. BÓZNER, M.
Využitie papierovej chromatografie k rozlišovaniu rôznych konopných odrôd v kyselých a zásaditých hydrolizátoch, resp. liehových výťažkoch z mladých rastliniek. (**The use of paper chromatography for distinguishing different hemp varieties by means of acid and alkaline hydrolysates and alcohol extracts from young plants.**) [English, Russian and German summaries ½ p. each.]
Rostlinná Výroba, 1960, **6**: 121-30, bibl. 7, illus.

The position, size and intensity of the spots produced on the chromatograms of these extracts by simple sugars were used to identify hemp varieties and establish affinities between them.

999. PASKOVIĆ, F.
Utjecaj gibberellinske kiseline na rast konopljine stabljike. **(The effect of gibberellic acid on stem growth in hemp.)** [English, French and German summaries.]
Tekstil, 1958, **7**(2): 105-24, from *Ref. Ž.* (*Biol.*), 1958, No. 23, Abstr. 104,773.

In glasshouse experiments hemp was sprayed with GA at 1, 10 and 100 mg./l. when the plants were 20, 40 or over 50 cm. high. Rates of 10 and 100 mg./l. applied on either of the first 2 dates increased stem height, but 1 mg./l. reduced it. Plants grown from seed treated with 1 and 100 mg./l. GA were smaller, but those treated with 10 mg./l. were larger, than the controls. All the sprayed plants had a tender, sickly appearance.

1000. ČAJLAHJAN, M. H., KOČANKOV, V. G., AND ZAMOTA, V. P.
The effect of gibberellin on the growth and yield of hemp and tobacco. [Russian.]
Fiziol. Rast., 1960, **7**: 340-3, bibl. 6, illus.

In container experiments 5 spray applications of 0·001–0·01% GA to hemp and 6 applications to tobacco increased the height of both plants 2½ times and their fresh weight almost as much, and doubled the number of tobacco leaves. In hemp the treatment increased the fibre content and the size of the staple and reduced the time required for retting. Whether such tall hemp (5 m.) can be grown in the field without lodging has yet to be determined, as has the quality of the treated tobacco leaf.

1001. MARTINEC, T., AND FELKLOVÁ, M.
Einfluss verschiedener Düngung auf die antibakterielle Aktivität des Hanfes (*Cannabis sativa* L.). **(Influence of various fertilizers on the antibacterial activity of hemp.)**
Veränderungen der antibakteriellen Aktivität im Verlauf der individuellen Entwicklung des Hanfes (*Cannabis sativa* L.). **(Changes of antibacterial activity in the course of the individual development of hemp.)**
Pharmazie, 1959, **14**: 276-9, 279-81, from *Biol. Abstr., Sect. D*, 1960, **35**, Abstr. 39,415.

The activity of *C. sativa* varies quantitatively, but not qualitatively, according to the stage of development of the plant. Only the leaves and inflorescences are active, the root and stem being inactive. The maximum inhibitory effects of leaf extracts generally occurred in August, and of inflorescences in September. Later in the season there was a marked decline in activity. It was found that P fertilizer promoted the antibacterial activity of the leaves and especially of the inflorescences. The organs of K- and N-fertilized plants were less active. Control plants in the first phase of growth showed lower activity than fertilized plants, but in subsequent phases of growth this difference became much less pronounced.—Fac. nat. Sci., Brünn, Czechoslovakia.

1002. LANZA, J., AND OTHERS.
Contribution à l'étude chimique des graines de kapok (*Ceiba guineensis* Chev. var. *clausa*). **(A contribution to the chemical study of kapok seeds.)**
Oléagineux, 1960, **15**: 719-20, bibl. 5.

The chemical constituents of the decorticated seeds and the amino acids of the protein fraction are tabulated.

1003. ODIŠARIJA, K. JU.
New Zealand flax and the biology of its seed germination and seedling growth. [Russian, with English summary ⅓ p.]
Subtrop. Kul'tury, 1959, No. 3, pp. 97-102, illus.

Following a brief description of *Phormium tenax*, hitherto grown in the U.S.S.R. mainly as an ornamental, some results are given of experimental work. The best germination was shown by seeds that were soaked for 5 days and then sown 1–1·5 cm. deep in groups of 15–20. Forms with variegated leaves such as *P. tenax aureo-marginatus* and *P. tenax aureo-striatus* germinated, but the seedlings were albinos and died within a month. The growth rate of the green leaved form over a 5-year period is recorded.

1004. GUPTA, S. C., THOMBRE, M. V., AND DESAI, M. C.
A case of triploidy in ramie.
Curr. Sci., 1960, **29**: 191-2, bibl. 3, illus.

The first recorded case, now among 40 selections under trial at Poona.

1005. TANGANYIKA SISAL GROWERS' ASSOCIATION (LOCK, G. W., AND OTHERS).
Annual Report of the Sisal Research Station, Mlingano, Ngomeni, for the year 1958, 1960, pp. 36, illus.

Brief notes are given on the progress of numerous experiments. These include: *Bulbil nurseries*: Sisal waste was again shown to be the best manure for nursery plants [see *H.A.*, 29: 650]. *Planting material and plant protection*: Up to the 4th cut plants raised from bulbils have outyielded those raised from suckers; in this and other trials aldrin, dieldrin and a new unnamed chemical gave good control of the sisal weevil (*Scyphophorus acupunctatus*). *Cultivation systems*: In a trial initiated in 1936 clean-weeding has reduced yields from 14·4- 14·5 tons fibre per ha. in the 1st cycle to 0·4 per ha. in the 4th cycle (1st cut). In a trial started in 195 clean-weeding is being compared with 3 cover crops. Up to the end of 1958 the cover crops had slightly depressed yields both in the presence and the ab sence of manure. These 2 results confirm that clean-weeding gives the best yields on fairly fertile soils but is not suitable for continued practice over several cycles. *Cutting methods*: To date the Early Cutting Trial 1951 shows a 72% decrease in fibre yield due to over-cutting and very early cutting. *Manurial trials* include NPKCa factorial, sisal waste, N fertilizers, lime, and spacing × fertilizer. *Herbicide trials*: In a bulbil nursery the best results were given by 5 or 10 kg. CMU per ha. applied before planting. *Plant physiology*: Nursery trials in progress concern the effects on soil of sisal waste, N and P inorganic fertilizers and mulch. The effect of waste is outstanding. *Spectrographic chemistry*: Further leaf studies have confirmed that chlorotic mottle is due to excessive uptake of Co and/or Mn.

1006. May, W. B., and Diekmahns, E. C.
Rapid propagation of sisal hybrid No. 11648.
E. Afr. agric. For. J., 1960, **26**(1): 68.

Within 8 weeks of planting in a field nursery 70% of single rhizome buds, removed from 1-year-old plants, had developed into plants 4–6 in. high. Untreated buds grew more successfully than those treated with root hormones and fungicide. Close spacing (10 × 10 cm.) with a mulch of well rotted sisal waste 1–1½ in. deep is recommended.—E.A.A.F.R.O., Kikuyu, Kenya, and Sisal Res. Stat., Mlingano, Tanganyika.

1007. Fleming, S. D.
Herbicides in sisal cultivation.
World Crops, 1960, **12**: 219-21, 267-70, illus.

Various grasses, including *Digitaria scalarum* and *Imperata cylindrica*, and *Mucuna pruriens* have been effectively controlled in sisal plantations by MCPA, 2,4-D and 2,4,5-T. Dalapon, simazine and atrazine have also shown considerable promise. The advantages claimed for chemical over mechanical weed control are savings in time and expense and retention of soil moisture and structure.

Gums.

1008. Mikailov, M. A.
Forms of *Astragalus pycnophyllus* with high gum contents. [Russian.]
Agrobiologija, 1960, No. 2, p. 304.

Number and dates of tappings and yields tabulated.

1009. Guess, W. L., Hall, N. A., and Rising, L. W.
A gum from rain lily, *Cooperia pedunculata*.
J. Amer. pharm. Ass., sci. Ed., 1960, **49**: 102-5, bibl. 11.

Bulbs dug in the early spring contained a gum with physical properties similar to those of other pharmaceutical gums [see also *H.A.*, 30: 932]. The gum was found to be a polysaccharide with mannose as the principal sugar.—Univ. Wash., Seattle.

Hops.

(*See also* 151.)

1010. D.S.I.R., N.Z., and Cawthron Institute.
Hop research: Annual Report for 1958-59, pp. 2.

Of the 3 seedlings resistant to root rot mentioned in last year's report 2 have remained free of rot but the third has shown infection. Bullion has yielded poorly. Ten years' study of environmental effects on growth has shown that neither total rainfall nor its distribution have affected yield. The Californian variety begins to develop its shoots when the average daily air temperature reaches 54° F. and flowers at 64° F. For a maximum crop the air temperature should increase steadily over the first 8 weeks of growth. As regards light intensity, bright sunshine, especially during the 3rd to 8th weeks after shooting, produces the heaviest crops. Planting cuttings 12 in. below the original soil level followed by "hilling-on" up to 10 in. above the original soil level has not affected yield. In the continuing fertilizer trials the highest yields, 2,760 lb. per acre, were obtained with 10 cwt. of standard fertilizer plus 1 cwt. of sulphate of ammonia applied in December. In the absence of K yields were poor. Of the N fertilizers under test sulphate of ammonia and nitrate of soda have given the highest yields, namely 2,576 and 2,409 lb. of dried hops per acre, respectively.

1011. Garbuzova, D. A.
The effect of meteorological conditions on the accumulation of bitter substances and cone morphology in different hop varieties. [Russian.]
Bot. Žurnal, 1960, **45**: 551-5, bibl. 5.

The combined effects of temperature, rainfall and humidity on the quality and yield of the cones of several hop varieties are tabulated and discussed. High temperatures, humidity and rainfall during cone formation resulted in large and heavy cones with numerous bracts, high yields and a high content of bitter substances.

1012. Hoed, F., Hoed J., and Speleers, A.
Essai de forçage du houblon à l'Institut National Belge du Houblon. (**Hop forcing trials at the Belgian National Hop Institute.**)
Ann. Gembloux, 1960, **66**: 40-8, illus.

See *H.A.*, 30: 5768.

1013. Majewski, K.
Wpływ nawożenia mineralnego na plon i jakość chmielu. (**The effect of mineral fertilization on the yield and quality of hops.**) [English and Russian summaries 1½ pp. each.]
Rocz. Nauk rol., Ser. A, 1959, **80**: 367-90, bibl. 19.

On loess, podsol and alluvial soils 62 kg. N, 64 kg.

P_2O_5 and 200 kg. K_2O per ha. in the form of calcium nitrate, superphosphate and potash salts gave higher yields and better quality than 46·5 kg. N, 48 kg. P_2O_5 and 120 kg. K_2O, and the latter was better than PK only. The increases in yield ranged from 59 kg. per ha. on podsols to 164 kg. on loess soils. The effect of top-dressings varied with weather conditions, particularly the amount and distribution of rainfall in June to August; but quality was improved by top-dressing with PK.

1014. Brooks, S. N., and Keller, K. R.
Effect of time of applying nitrogen fertilizer on yield of hops.
Agron. J., 1960, **52**: 516-18, bibl. 8.

Single and split applications of ammonium nitrate to give a total of 100 lb. N per acre per season over 4 years were applied at various times between April and August to a mature stand of Fuggle hops in Oregon. Greater yields were obtained from the earlier N applications. Split applications had no advantage, provided that sufficient N was available when the hops started to flower. An average of 3·85 lb. of kiln-dry hops was produced for each pound of N applied. N had no effect on the alpha-acid and beta-fraction percentages in the strobiles. [For related work on chemical composition see *H.A.*, 25: 773.]—U.S.D.A. and Ore. agric Exp. Stat., Corvallis.

1015. Zattler, F., Kleber, W., and Schmid, P.
Content of α-acids in ripening hops. [German?]
Brauwissenschaft, 1960, **13**: 72-4, from abstr. in *J. Sci. Food Agric.*, 1960, **11**: ii-127.

During ripening definite maxima of acids were found. The dates on which the maxima occurred varied with the variety and the level of N manuring. Light N manuring resulted in greater increases in the acids content than medium or heavy manuring.

1016. Paršikov, V. M.
The effect of boron on the development and productivity of hops. [Ukrainian, with English and Russian summaries.]
Dopovidi AN URSR, 1957, No. 6, pp. 602-4, from *Ref. Ž.* (*Biol.*), 1958, No. 23, Abstr. 104,375.

The application of 1 kg. B per ha. in the form of borax, in addition to a complete fertilizer, improved the growth of hops, advanced development and increased yields. In the leaves the content of soluble sugars, especially sucrose, increased when B was applied in conjunction with liming. B also increased the chlorophyll content, carbohydrate and protein metabolism and catalase and peroxidase activity, extended the active life of the leaves, improved flower and cone formation and aided the economic utilization of P and K. [For similar work with Mn see *H.A.*, 29: 2684.]

1017. Weston, E. W.
Changes in sex in the hop caused by plant growth substances.
Nature, 1960, **188**: 81-2, bibl. 5, illus.

Plants of the genetically female variety Fuggles were sprayed with a 500 p.p.m. solution of α-(2-chlorophenylthio)propionic acid at 2-day intervals from early July until early August. Those sprayed on July 2 and 4 developed many male flowers, those sprayed on July 6 a few, while later sprayings caused practically none to develop. The possible reasons for this response are discussed.—Wye Coll., Ashford, Kent.

1018. Anon.
New method of attack on hop wilt has a double purpose.
Comm. Gr, 1960, No. 3378, p. 676.

A method of composting bines which may be diseased is described. Bines loosely-packed in pits will heat up to 80° C., while the *Verticillium* wilt fungus is killed at 40° C.

Insecticidal plants.

(*See also* 1652, 1664, 1675.)

1019. Mendes, L. O. T.
Seleção e melhoramento do timbó. I. Estudó de uma população de 235 plantas de timbó urucu (*Derris urucu* (Killip & Smith)). **(Selection and improvement of derris. I. A study of a population of 235 derris plants.)** [English summary 1¼ pp.]
Bragantia, 1959, **18**: 483-515, bibl. 1.

In 235 plants analysed for selection purposes the average content of total extract in the roots was 18·32% and the average rotenone + degueline, rotenone, and degueline contents were 12·67, 6·07 and 6·53%, respectively. The average rotenone content of the roots of 12 selected 19-month-old high-rotenone plants was 10·18%.

Rubber plants.

1020. Dorado Bernal, E.
Caractéristiques du caoutchouc de guayule. **(The characteristics of guayule rubber.)** [English, German, Italian and Spanish summaries 12 lines each.]
Rev. gén. Caoutch., 1960, **37**: 673-80, bibl. 4, illus.

The plant is described with details of its anatomy. The physical and chemical properties of the latex are examined and the methods of processin outlined. The effect of the non-rubber constituent on vulcanization are discussed, and the modifications induced by treatment with maleic anhydrid are explained. [See also *H.A.*, 30: 5780.]—Inst José Celestino Mutis Farmacog., Madrid.

Seed oils.

(*See also* 854, 1406, 1482, 1675.)

021. Williams, J. H., and Swinbank, J. C.
Castorbean production in Nebraska.
[*Mimeo. Publ.*] *Neb. agric. Ext. Serv.* **C.C. 180**, 1960, pp. 4.

ll aspects of growing the crop briefly described.

022. Allen, G. H., and Cowdry, W. A. R.
Castor bean in more trial plantings.
Qd agric. J., 1960, **86**: 225-7, illus.

rials with imported varieties are in progress to nd types that combine disease and drought resis- ance with a growth form suitable for mechanical arvesting.

023. Canecchio, V., (Filho), and Freire, E. S.
Adubação da mamoneira. II. Experiências de espaçamento × adubação. (**Castorbean fertilization. II. Spacing × fertilization trials.**) [English summary ½ p.]
Bragantia, 1959, **18**: 77-99, bibl. 13.

n trials on the dwarf variety IA-38 at 4 localities N, P and K were applied alone and in various ombinations and there were 3 spacings, 1·5 × ·2 m., 1·0 × 0·9 m., and 1·0 × 0·45 m. Under avourable conditions yields and responses to utrients were greater at the medium and close pacings.

024. Thomas, C. A.
Relations of variety, temperature, and seed immaturity to pre-emergence damping-off of castorbean.
Phytopathology, 1960, **50**: 473-4, bibl. 3.

eeds of 18 castorbean varieties were planted in a : 1 soil compost-vermiculite mixture and sub- ected to temperatures of 30, 20, 15 and 10° C. The temperature which produced the largest eduction in stand differed with the varieties and ppeared to be unaffected by seed maturity. mmaturity, due to early defoliation by drought, rost, chemicals or disease, appeared to be the chief actor responsible for the predisposition of seeds to re-emergence damping-off. This predisposition was correlated with seed permeability, which could be determined from the conductivity and reducing- ugar content of the seed steep-water [see *H.A.*, 30: 4129].—Agric. Res. Serv., U.S.D.A., Beltsville, Md.

025. Konwar, P. C.
Observation of hermaphroditism in the flowers of *Ricinus communis* Linn. (castor plant).
Sci. and Cult., 1960, **26**: 83, illus.

About 1% of the flowers observed were bisexual; hey possessed fewer stamens than normal and produced less spiny fruits.

1026. de Seabra, L., Ferreirinha, M. P., and de Freitas, M. C. P. G.
Contribuições para o conhecimento tecnológico da flora do ultramar—*Ricinus communis* L. (**Contributions to the technological knowledge of the overseas flora—*Ricinus communis*.)**
Garcia de Orta, 1959, **7**: 77-88, bibl. 5, illus.

Stems of castor plants used for paper manufacture.

1027. Ventura, M. M., and Hollanda Lima, I.
Proteínas da semente de favela (*Cnidoscolus phyllacanthus* (Mart.) Pax et K. Hoffm.). I. Solubilização e comportamento electroforético. (**Proteins in the seeds of favela, *Cnidoscolus phyllacanthus*. I. Solubilization and electrophoretic behaviour.**) [English summary ½ p.]
An. Acad. brasil. Ciên., 1960, **31**: 537-46, bibl. 8.

The seeds of the shrub *Cnidoscolus phyllacanthus* contain about 50% of edible oil and 35% of crude protein. The possibilities of refining both components for consumption are being studied.—Univ. Ceará, Fortaleza.

1028. Schijfsma, L., Hoesbergen, M., and Nijdam, F. E.
A study of the colour and other characters of the seed of some varieties of oil seed poppy. [Dutch summary ½ p.]
Euphytica, 1960, **9**: 127-40, bibl. 6, illus.

In some varieties selection for colour shade did not result in a shift in the range of colour, whereas in others this did occur. There was a high correlation between colour shade and the calcium oxalate content of the outer layer of the seed coat. Within varieties the height of the ridges on the seed coat was negatively correlated with the weight of the kernel.—I.V.R.O. Wageningen.

1029. Balbi, G.
L'olio di papavero nella fabbricazione di prodotti vernicianti. (**Poppy seed oil in the manufacture of paints and varnishes.**)
Olearia, 1960, **14**: 97-104, bibl. 58, illus.

A review, including composition figures.

1030. Thomas, C. A., Rubis, D. D., and Black, D. S.
Development of safflower varieties resistant to phytophthora root rot.
Phytopathology, 1960, **50**: 129-30, bibl. 4, illus.

The variety Gila [see *H.A.*, 29: 3840] produced higher yields than Nebraska-10 in 11 irrigated tests and in 11 out of 16 dryland tests conducted in 12 different States. B7-398-1 was equal to, or significantly better than, Nebraska 10 in preliminary tests.—U.S.D.A., Beltsville, and Ariz. agric. Exp. Stat., Tucson.

1031. Armour, R. P.
Investigaciones sobre *Simarouba glauca* (aceituno) en El Salvador. **(Studies on *Simarouba glauca* (the aceituno tree) in El Salvador.)**
Proc. Carib. Reg. Amer. Soc. hort. Sci., 1957, 1958, **5**: 33-44, bibl. 11.

See *H.A.*, 30: 4135.

Tannin plants.

(*See also* 1472.)

1032. Tischer, J.
Über einige Inhaltsstoffe der Früchte des Hirschkolbensumachs (*Rhus typhina* L.). **(Some constituents of the fruits of *Rhus typhina*.)**
Pharmazie, 1960, **15**: 83-9, bibl. 13.

Examination showed the presence in sumac fruits of appreciable amounts of malic acids, especially potassium and calcium salts. Tannins were found in both fruits and leaves, as also daucosterin in the fruit skins and anthocyanin in the fruit hairs. In addition notes are given on fatty acids and other components of the fruit skins.—Martin-Luther-Univ., Halle-Wittenberg.

1033. Elmer, J. L.
Further notes on boron deficiency in the Nandi Hills.
Tea, 1960, **1**(4): 21-2.

Symptoms of B deficiency in wattle trees, which are described, appeared only during dry weather, when the humidity of the atmosphere was low and winds were strong. If the dry season followed a year of good rains, the incidence of the disorder was negligible. B deficiency was not confined to one type of soil. In an area where wattle planting had failed because of the disorder the application of sodium borate at 45 lb./acre alleviated the deficiency. [For B deficiency reported in *Grevillea* in this area, see *H.A.*, 30: 6256.]

Sundry plants.

1034. Malik, H. C., Kalia, H. R., and Gahlaut, R. S.
The plant that yields henna.
Indian Fmg, 1960, **10**(1): 11-12, illus.

Nursery work, establishment, harvesting the leaves and economics of henna (*Lawsonia inermis*).

1035. Stott, K. G.
A review of the British basket-willow growing industry.
A.R. Long Ashton agric. hort. Res. Stat., 1959, 1960, pp. 155-65.

History and notes on similar industries in other countries. Production figures show that the acreage devoted to basket willow cultivation is a little greater than that in Spain but much less than that in Western Germany and very much less than that in Poland and Holland. The growing importance of the variety *Salix triandra* Black Maul is noted.

FLORICULTURE.

General.

1036. Moore, F. S.
The role of floriculture in the agriculture of Florida.
Diss. Abstr., 1960, **20**: 4074, being *L.C. Card No. Mic.* 60-863 of 208 pp.

A general survey of an important industry.

1037. Aalsmeer (Wasscher, J.).
Jaarverslag van het proefstation voor de bloemisterij in Nederland te Aalsmeer over 1959. (**Annual Report of the Aalsmeer Research Station for Floriculture in Holland for 1959**), pp. 115, illus.

In addition to work abstracted separately below, this report contains information on: *Carnations:* trickle irrigation, N/K manuring, nutrient composition of the plants, variety trials, disease control, the production of virus-free material. *Azaleas:* soil media and fertilizers. *Begonias:* leaf spot. *Chrysanthemums:* variety trials. *Cyclamen: Botryis* control. *Dahlias:* variety trial. *Helleborus:* weed control by PCP in oil, followed by simazine. *Sweet peas:* variety trial. *Lilies:* Comparison between the growth and flowering of *Lilium candidum* bulbs from Holland and Israel; comparison between strains of *Lilium speciosum rubrum*. *Orchids:* growing *Paphiopedilum* in gravel culture; virus diseases of *Cymbidium*. *Oxalis:* forcing *O. cernua plena* as a pot plant. *Phlox:* variety trials. *Prunus triloba:* phenological studies on *Enarmonia*. *Roses:* variety trials, nematode studies. *Lilac:* weed control. *Forcing shrubs:* salt damage related to soil moisture contents. *Tritonia:* storage temperatures for corms. *Miscellaneous:* studies on new acaricides, a summary of disease studies 1956–1959, soil and water analysis.

1038. Furuta, T.
Ala. study evaluates production methods, polyethylene packing.
Flor. Exch., 1960, **135**(1): 22-4, 26-7, 29-30, 32.

Work in progress at Alabama Agricultural Experiment Station is reported in this article. Work on the use of polythene for packing nursery stock has been abstracted separately [see abstract 1052]. Other work is described under the following headings: *Propagation of plants:* Studies on rooting *Malus* species (M.VII and M.IX, Anoka, *M. atrosanguinea*, *M. halliana parmanii*) under mist showed that (a) fewer cuttings died in open than closed beds, but more cuttings rooted when the eds had a plastic cover, (b) fewer cuttings died when n electronic leaf was used than under interrupted nist [controlled by a time switch], although rooting ercentages were similar, (c) rooting was little ffected by hormone or anti-transpirant treatments, nd (d) cuttings taken in early May rooted better han those taken in late May. Seeds of *Camellia asanqua*, *C. japonica*, *Quercus alba* and *Cornus orida* germinated more rapidly after a 24-hour oak in a gibberellin solution. *Production in ontainers:* Methods of growing and fertilizing ontainer-grown chrysanthemums are discussed in ome detail. *Fertilizer studies: Ilex crenata* plants n containers made less growth when over 5% K_2O vas applied, and when N, P_2O_5 and K_2O were upplied in amounts exceeding 10:10:5. Growth of *Magnolia grandiflora* was increased by increasing he supply of macronutrients from 5% to 10%; N appeared to be the limiting factor to increased growth. In studies on the incorporation of lime and P in container composts before planting, the heaviest plants of *Camellia japonica*, *Ilex crenata* "Roundleaf", *Magnolia grandiflora* and *Azalea* "Hexe" were produced by mixing cottonseed meal and 0:14:14 fertilizer before planting, with fortnightly doses of 13:26:13 thereafter; pre-planting incorporation of dolomite and lime and fortnightly applications of 8:0:8 were best for *Gardenia radicans* and *Pittosporum tobira;* the same fertilizers before planting plus 8:8:8 applied every 2 weeks gave the heaviest plants of *Magnolia soulangeana* and *Camellia sasanqua;* increased growth followed increased Ca levels with *Magnolia grandiflora, M. soulangeana, Pittosporum tobira* and *Azalea* "Hexe"; high P levels were detrimental to growth of *P. tobira*. *Control of growth:* The azalea varieties Hino, Coral Bells, Hexe and Red Wing budded best and were forced most evenly when grown in green saran cloth houses with 22–46% shading during the summer; cloth houses were better than lathe houses. With hydrangeas the largest number of flowers was produced in a cloth house that reduced light by about 22%. Supplementary lighting for *Ilex crenata* (varieties Convexleaf and Roundleaf) resulted in more growth.

1039. BALOGH, A.
A múlt század kerttervező művészetéről. **(Garden design during the past century.)** [Russian and German summaries 1 p. each.]
Kert. szől. Főisk. Évk., 1958 (issued 1959), **22**(6, part 7): 3-27, illus.

Nineteenth century developments in Hungary.

1040. VAN DOESBURG, J., AND RAVENSBERG, K.
Enten en stekken onder waternevel. **(Grafts and cuttings under mist.)**
Jaarb. Proefst. Boomkw. Boskoop, 1959, pp. 27-38, illus.

Studies on the effect of 4 air environments on graft unions have not yet given definite results, although callusing has been poorer with mist and humidification than under double glass. With cuttings the best rooting percentages with ornamental shrubs (including climbing plants) were obtained in mist. Azalea cuttings rooted best under mist in a plastic-lined house and with humidification; rhododendrons rooted better with mist or humidification than under double glass, and soil warming (25° C.) was beneficial for Edward S. Rand and Pink Pearl. The pH of rooting media was increased by using canal water, especially in the plastic-lined house with misting. The rooting percentage of conifers was low in all environments.

1041. STOLLE, G., AND SCHÖNBERG, G.
Erfahrungen mit der Stecklingsvermehrung unter Sprühnebel. **(Observations on the propagation of cuttings under mist.)**
Dtsch. Gartenb., 1960, **7**: 122-4, illus.

A mist unit was operated in a plastic house, with continuous or intermittent misting according to light conditions. The cuttings were rooted in boxes laid on tiles on the floor of the house. Softwood cuttings of most of the 47 ornamental species tested (including deciduous and evergreen shrubs and herbaceous pot plants) showed more than 80% rooting.—Inst. Gartenb., Dresden-Pillnitz.

1042. MACHOVEC, J.
Působení růstových stimulátorů na chemismus zelených řízků okrasných dřevin a jejich vztah k zakořeňování. **(The effect of growth substances on the chemistry of softwood cuttings of woody ornamentals in relation to rooting.)** [Russian and German summaries ¼ p. each.]
Acta Univ. Agric., Brno, Ser. A, 1959, Special No., pp. 51-6, bibl. 7.

Equal parts of NAA and IBA applied in solution to soft-wood cuttings of *Ligustrum ovalifolium*, *Syringa vulgaris*, *S. chinensis* and some other ornamentals reduced the glucose:sucrose ratio. In powder form the mixture had the same effect, although it was manifested more slowly. The rooting response increased with the increase in sucrose content, except in the case of *Rosa gallica splendens*, in which excessive callus formation adversely affected rooting [see also *H.A.*, 29: 744].

1043. SEMENIUK, P., AND STEWART, R. N.
Effects of temperature on fruit and seed production of lily, stock, poinsettia, rose, and snapdragon.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 726-9, bibl. 5.

Many flower species have failed to produce an appreciable seed crop when grown at standard forcing temperatures. Therefore groups of test plants were exposed to different temperatures, ranging from 50° to 90° F., from the time of dehiscence of the first flower until 2 weeks after the last pollination. Fruits and seeds were formed on snapdragons grown at 50° and 60°, but not at higher temperatures. Stocks produced no fruits or seeds at 90°, very few at 80° and a maximum number at 60°. The optimum temperature for the production of fruits and seeds of a multiflora hybrid rose and of poinsettias was 70°. Reciprocal crosses between the lily cultivars Croft and Georgia produced seed at all the experimental temperatures between 55° and 85°, with the optimum at 75°.—U.S.D.A., Beltsville, Md.

1044. LINDSTROM, R. S., AND TOLBERT, N. E.
(2-Chloroethyl)trimethylammonium chloride and related compounds as plant growth substances. IV. Effect on chrysanthemums and poinsettias.
Quart. Bull. Mich. agric. Exp. Stat., 1960, **42**: 917-28, bibl. 5, illus.

The action of (2-chloroethyl)trimethylammonium chloride (CCC), (2-bromoethyl)trimethylammonium bromide (BCB) and allyltrimethylammonium bromide (AMAB) was tested on growth and flowering of chrysanthemum and poinsettia. The chemicals were most effective when applied as a soil drench or mixed directly with the soil. All chemicals were effective when 100 ml. of 10^{-2} M solution were poured on the soil of a 4-inch pot. A 5×10^{-2} M solution produced more severe effects. The most characteristic growth alteration was the development of very short plants with thick stems. The number of leaves was not altered, nor was there a substantial change in the number of days to flowering. Chrysanthemum leaves were darker green and thicker than on untreated plants. The weight of treated plants was not severely reduced by these treatments. Less wilting during growth and improved keeping quality of the plants after flowering were observed. The application of gibberellin prior to the flowering of treated chrysanthemums produced a more satisfactory inflorescence. [Authors' summary.]

1045. NATIONAL WEED COMMITTEE, EASTERN SECTION.
[Weed control in] ornamentals.
Res. Rep. east. Sect. nat. Weed Cttee Canada 1959, pp. 90-1.

Two reports are summarized. When herbicides were applied 2 days after planting gladiolus corms in July, propazine at 2 and 2·5 lb./acre and simazine at 2 lb./acre were the most effective in controlling weeds without damaging the gladioli. Of 6 herbicides applied in August to a weed-free bed of annual flowers in full bloom, comprising petunias, snapdragons, salvias, marigolds, zinnias, calliopsis and stocks, 2,4-DES at 4 lb./acre gave the best control of germinating broad-leaved weeds and caused only little injury to the flowers.—From *Weed Abstr.*, **9**, No. 952.

1046. VAN DER LAAR, H. J.
Chemische onkruidbestrijding op zaaibedden voor de opkomst. **(Pre-emergence weed control by chemicals in seed-beds.)**
Jaarb. Proefst. Boomkw. Boskoop, 1959, pp. 85-7.

Shell W again proved an excellent pre-emergence herbicide for seed-beds. When seeds of broad-leaved and coniferous species were sown deeper than 2 cm., weeds were controlled satisfactorily by Carburine, diquat, Tri-P.E. and PCP in oil. CIPC, Orga 222 and simazine were also effective, although CIPC caused injury to *Pinus sylvestris* and *Picea abies* and simazine to *Pinus sylvestris*.

1047. SCHMADLAK, J., VÖLKEL, H., AND ZAHN, F. P.
Die chemische Unkrautbekämpfung in Baumschulkulturen. **(Chemical weed control in nurseries.)**
Dtsch. Gartenb., 1960, **7**: 125-8, bibl. 3, illus.

The contact herbicides Hedolit and EP30 (pentachlorophenol) controlled dicotyledonous weed growth in nurseries without injury to the plants, provided spraying was carried out carefully. Supplementary hoeing, however, was required in the root zone or if grasses were present. Aminotriazine preparations (simazine, W 6658 and Bi 50) controlled both grasses and broad-leaved weeds if applied as pre-emergence sprays. Amounts to be used with fruit trees, woody ornamentals and roses are specified.—Inst. Gartenb., Dresden-Pillnitz.

1048. MILLER, H. N.
Nematode control on ornamental plants with soil fumigants.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 403-8.

Nemagon at 2 and 4 gal. technical material per acre applied as a drench or injected or broadcast in granular form and VC13 at 13 and 27 gal. per acre applied as a drench gave significant reductions in root-knot nematodes on established privet, boxwood and gardenia plants. VC13 was superior to Nemagon, and Nemagon applied as a drench or injected was better than granular Nemagon broadcast. The higher rates used were significantly better than the lower.—Fla agric. Exp. Stat., Gainesville.

1049. SHREAD, J. C.
Systemic insecticides for control of scales, leaf miners and lace bugs.
J. econ. Ent., 1960, **53**: 406-8, bibl. 3.

Soil drenches of phorate and Phosdrin were more effective than Di-Syston and Sytam (4 lb. per gal. of schradan) in controlling scale (*Asterolecanium* sp.) on holly. Dimethoate granules controlled leaf miners in holly (*Phytomyza ilicis*) and boxwood (*Monarthropalpus buxi*) and lace bugs (*Stephanitis* spp.) on andromeda [*Pieris japonica*], azaleas and rhododendrons. Phosphamidon gave poor control of leaf miners but good control of lace bugs. [From thor's abstract.]—Conn. agric. Exp. Stat., New aven.

1050. LENANDER, S. E.
Kylförvaring av rosor och nejlikor. (**Cold storage of roses and carnations.**)
Sverig. HandelsträdgårdsmForb. Årsb. 1959, reprinted as *Särtrycksser. Trädgårdsförs. Alnarp* **117**, 1960, pp. 13, bibl. 6.

ut roses could be satisfactorily cool-stored in ater for at least 10 days, and still last for about days at room temperature. Results were best at C. At 5° C. the quality of some varieties was ood, but there was some "blueing" with certain d varieties. Roses should not be kept in a 4% gar solution before marketing, as they develop af chlorosis. The best temperature for carnations as 5° C., and standing them in a 4% sugar solution ad a good effect on their keep quality.

051. TOY, ST. J., AND MAHLSTEDE, J. P.
Prolonging dormancy of nursery stock by increasing the concentration of carbon dioxide in the storage atmosphere.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 774-84, bibl. 9.

ew growth developing on dormant nursery stock uring shipment or holding is considered undesir-ble. Experiments were conducted using high oncentrations of CO_2 gas (up to 80%) to retard ch growth. Experimental containers used in ese experiments were Cryovac and polythene lastic bags. The plant materials used were ormant rose plants and dormant crowns of olumbine, delphinium, phlox and stokesia. In eneral, CO_2 concentrations of 40% or more hibited both shoot and root growth for a period f 2 weeks at an average temperature of 80° F. here was no visible injury by CO_2 at levels up to 0% on the rose varieties used in these studies. lthough there was a retarding effect of high CO_2 oncentrations on the growth of roses after they ere planted out, a reverse effect was noted on the erbaceous perennials. Mould was not a problem n atmospheres of 40% or less CO_2. [From uthors' summary.]—Iowa St. Univ., Ames.

052. FURUTA, T., PATE, J., AND PERRY, F.
Marketing ornamentals. Studies in packing and shipping.
Amer. Nurserym., 1960, **112**(1): 160-3, bibl. 2.

he use of plastic film for wholesale lots of plants educed packing and transport costs by comparison ith a conventional pack of paper and moist acking material. Evergreen plants should not be ompletely enclosed by plastic packing material.— la. agric. Exp. Stat., Auburn.

053. CARRA, P.
Essais de conservation des fleurs par le froid 1955-1956. (**Experiments on the cold storage of cut flowers, 1955-1956.**)
Rev. hort. Algér., 1959, **63**(10/12): 28-36.

Investigations on 8 genera showed that flowers picked early in the morning and put in water immediately last longer in the vase the lower the temperature. Flowers can be stored for a certain period at 4° C., the mean storage period being 4–5 days with roses, 10–12 with *Strelitzia reginae*, 3–4 with gerberas, 5–6 with arums, 6–7 with narcissi, 4–5 with freesias, 5–6 with tulips and 6–8 with gladioli. Flowers can be stored for 1–2 days in a cool place in the dark without recourse to cold storage.

1054. BAKKER, J., AND DE BEL-VAN DEN ELST, A.
Houdbaarheidsproeven met snijbloemen. (**Prolonging the life of cut flowers.**)
Jversl. Proefst. Bloem. Aalsmeer, 1959, pp. 105-6.

Observations were made on the behaviour of 6 species placed in water containing 12 g. chrysal per litre. In general, the treatment improved keeping quality. The development of ornithogalum flowers after 1–4 weeks' storage at 5–6° C. was normal, but there was no difference in keeping quality; those cooled for 8 weeks did not open, and only the lowest flowers opened following 7 weeks' cold storage. *Bouvardia humboldtii* developed satisfactorily from bud to market-maturity in a 2% sugar solution (plus 30 mg. silver nitrate) and in chrysal at 12 g./l. [For earlier work, see *H.A.*, 30: 979.]

1055. v. LINDENWALD, H. C.
Eine neue Möglichkeit, Schnittblumen frisch zu halten. (**A new way of keeping cut flowers fresh.**)
Gartenwelt, 1960, **60**: 237-8, bibl. 1.

Methods of keeping cut flowers fresh without water are discussed. A suspension of about 10% of finely divided bentonite in water forms a paste, which acts as a water donor to flowers when their cut stems are inserted in small amounts of it held in little plastic bags. Flowers used for wreaths, buttonholes, etc., remain as fresh as in water. When 40 species of wild and garden flowers were treated and held at 15, 20 and 30° C., all, with the exception of roses, kept well.

Annual and herbaceous plants.

(*See also* 15, 71, 167, 168, 190, 394.)

1056. JOINER, J. N.
Effects of kinds of pots and frequencies of watering on snapdragons, petunias and calendulas from seedling stage to maturity.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 434-7, bibl. 5.

Snapdragons, petunias and calendulas were grown for 3½ weeks before being planted out in clay, organic and aluminium pots and in plant bands, and were watered every day, every 2 days or every 4 days. In general, the frequency of watering did not affect extension growth or the fresh or dry weight after planting out. Plants in organic pots and bands grew equally well and were taller in the seedling stage, and heavier in the later stages, than those in clay or aluminium pots. Growth was least satisfactory in the aluminium pots, and they were also difficult to handle.—Univ. Fla, Gainesville.

1057. Černý, J.
Využití meziodrůdového křížení (heterosis) v květinářství. (**The use of intervarietal crossing (heterosis) in flower growing.**) [Russian and German summaries 9 lines each.]
Acta Univ. Agric., Brno, Ser. A, 1959, Special No., pp. 39-44, bibl. 2.

Descriptions of 3 hybrids of *Begonia semperflorens gracilis* and one of *Petunia hybrida*.

1058. Bonifacio, A.
Il virus del giallume dell'aster e gli insetti. (**Insects and the yellows virus of asters.**)
Riv. Ortoflorofruttic. ital., 1960, **44**: 260-1, bibl. 1.

The leaf-hoppers *Dalbulus maidis* and *D. elimatus* will normally parasitize asters only if these are infected with the yellows virus. After living for a time on the diseased plants they acquire an unusual longevity, which they retain if transferred to their primary host (maize), and also the ability to live on healthy asters for longer than the average life span.—Ist. Patol. for. veg., Univ. Firenze.

1059. Bik, R. A., and others.
Amerikaanse anjers. (**Perpetual flowering carnations.**)
Jversl. Proefst. Bloem. Aalsmeer, 1959, pp. 19-31.

Rotted garden turf alone or in a mixture made a satisfactory carnation soil, provided that regular feeding was given. Vapam at 100 c.c./sq.m., recommended last year for *Phialophora* control [see *H.A.*, 30: 984], must be regarded as the minimum effective dosage. *Pseudomonas caryophylli* infection did not spread at a glasshouse temperature higher than that usually provided for carnations; plants of Durango infected with *P. caryophylli* eventually died. Carnation mite (*Tetranychus cinnabarinus*) may be controlled by 2 spray applications of 200 c.c. Gesaspint or 350 c.c. Gusathion per 1,000 cu. m. or by one application of either of these followed by Tedion as a spray or smoke.

1060. Butters, K. D.
Spacing and timing are important.
Grower, 1960, **54** (Glasshouse Suppl.): 3-4.

The author considers that carnations can be spaced closer than the traditional spacing, and he favours 6 in. by 7 in. In trials with summer-planted carnations a spacing of 28 sq. in. gave the best economic results.—A. G. Sparkes Ltd., Angmering, Sussex.

1061. Goldsberry, K. L., and Holley, W. D.
Carbon dioxide in the greenhouse atmosphere.
Colo. Flower Grs' Ass. Bull., reprinted in *Flor. Exch.*, 1960, **134**(26):12.

Studies have shown that the average CO_2 level in the greenhouse during February (1959) never reached that of outside air and fluctuated widely from below 200 p.p.m. to above 250 p.p.m., and that plant growth is materially slowed down below 200 p.p.m. On cold, dark days with no ventilation the low CO_2 level limited sugar assimilation and growth. Levels of CO_2 were probably better maintained by fan ventilation than by gravity flow. In an experiment in progress, in which carnations are being maintained at CO_2 levels from 200 p.p.m. to 600 p.p.m., increasing concentrations have given definite linear increases in yield of dry matter, number of breaks and total yield of flowers.

1062. Holley, W. D.
Carnation calyx splitting.
Colo. Flower Grs' Ass. Bull., May 1960, reprinted in *Flor. Exch.*, 1960, **134**(26): 9, 12, bibl. 4.

A survey of commercial cultural practices showed that calyx splitting could be reduced by careful temperature control, the houses being heated to 60° F. on cool days, and cooled to 65° F. on sunny days.

1063. Aragaki, M., and Ishii, M.
Control of soil-borne diseases of carnations.
Hawaii Fm Sci., 1960, **8**(4): 3-4, illus.

Symptoms of a root rot and wilt complex caused by the fungi *Rhizoctonia solani*, *Sclerotium rolfsii*, *Fusarium roseum* and *F. dianthi* and the bacterium *Pseudomonas caryophylli* are given. Control was obtained by soil fumigation with methyl bromide (1 lb./100 sq. ft.), Mylone (300 lb./acre), chloropicrin (400 lb./acre) and Vapam (1 qt./100 sq. ft.) and by the use of pathogen-free propagation material. Weed control was also obtained with soil fumigation, being almost complete with MB.

1064. Raabe, R.
Cutting dip may spread carnation bacterial wilt.
Flor. Exch., 1960, **134**(26): 13.

In California an outbreak of bacterial wilt in rooted carnation cuttings was traced to the use of a Panogen 15 cutting dip for *Fusarium* control.

1065. Hellmers, E.
Nellikens rodhalsfusariose, stabfusariose og hvidkarfusariose som årsager til nedvisning af drivhusnelliker. (**Collar-fusariosis, stub-fusariosis and white-vessel fusariosis of carnations causing wilt of glasshouse carnations.**)
[English summary 4 pp.]
Horticultura, 1960, **14**: 89-128, bibl. 2 pp., illus.

ne symptoms caused on carnations by, and the iology of, *Fusarium culmorum* and *F. oxysporum* f. *anthi* are described in detail. Methods of ontrol, chiefly cultural and hygienic, are also viewed.—Roy. vet. agric. Coll., Copenhagen.

66. NELSON, P. E.
Fusarium stem rot of carnations.
Bull. N.Y. St. Flower Grs, 1960, No. 171, pp. 1-3, bibl. 4, illus., and *Flor. Exch.*, 1960, **135**(8): 10, 41.

ymptoms of stem rot on cuttings and mature owering plants are described. The organism sponsible is *Fusarium roseum*. For successful ontrol under New York conditions mother blocks hould be sprayed every 14 days during the winter nd every 7 to 10 days during the summer. hroughout the year spraying should be done lternately with zineb at 1½–2 lb./100 gal. and with aptan at 2 lb./100 gal. Cutting dips are not ecommended because of the danger of spreading arnation bacterial wilt. Sterile rooting media and eriodic fungicide drenches are also important.

067. GOULD, H. J.
Control of aphids and red spider mite on young carnations under glass.
Plant Path., 1960, **9**: 106-9.

n young carnation plants a single drench of ·035% Rogor or 0·025% demeton-methyl at to 5 fl. oz. per plant gave good control over 4 to 6 veeks, whereas 2 or 3 sprays of these and other naterials were necessary. On older plants Rogor nd demeton-methyl drenches were no more effecive than sprays and had a residual action of only to 2 weeks.—N.A.A.S., Cambridge.

068. GEHRING, F., AND SCHMIDT, G.
Über ein durch Larven der Trauermücke *Neosciara amoena* Winn. verursachtes ungewöhnliches Schadbild an Nelkenstecklingen im Gewächshaus. **(An unusual symptom of attack by *Neosciara* larvae on cuttings of glasshouse carnations.)**
NachrBl. dtsch. PflSchDienst., Braunschweig, 1960, **12**: 157-8, bibl. 5, illus.

amage caused by larvae of *Neosciara amoena* is escribed. Two sprays of parathion a week apart controlled the attack.—Inst. Bakt., and Inst. PflSch-Mittelforsch., Berlin-Dahlem.

069. MURPHY, T.
Chrysanthemum production for market. I. General considerations, varieties and propagation. II. Methods of growing. III. Late-struck cuttings and direct planting.
Mon. agric. Rep. Minist. Agric. Belfast, 1960, **34**: 330-3, 362-6; and **35**: 6-11.

Varieties, methods of propagation and growing including direct planting and growing for sale as ot plants), packing and marketing are described. Pests and diseases are listed, together with methods of control.

1070. SKOU, W. J.
Producing quality pot mums.
Ill. St. Flor. Ass. Bull., 1960, No. 206, pp. 5-8.

Advice for growers in America.

1071. V. D. ZWAARD, P., HAKKAART, F. A., AND MARCHAL, J.
Chrysant. **(Chrysanthemum.)**
Jversl. Proefst. Bloem. Aalsmeer, 1959, pp. 43-8.

The 2 viruses generally isolated from chrysanthemum varieties were cucumber virus 1 and virus b. Diagnostic methods are described. Control of viruses by selection on visible symptoms was not satisfactory, and selection by virus testing is to be studied. For weed control CIPC was the least phytotoxic, but simazine (0·1%) resulted in the best weed control. Herbicides should not be applied for 2 or 3 weeks after planting out.

1072. SHEEHAN, T. J., AND SAGAWA, Y.
The effects of gamma radiation on chrysanthemum and gladiolus.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 388-91, bibl. 11, illus.

Studies on the effect of gamma radiation on vegetative cuttings of *Chrysanthemum morifolium*, variety Bluechip, have been reported elsewhere [see *H.A.*, 30: 5814]. None of the dosages ranging from 0 to 33,840 r proved lethal to corms of the gladiolus variety Spic and Span. Vegetative growth was reduced, but no flower colour mutants were noted.—Univ. Fla, Gainesville.

1073. WOLTZ, S. S.
Symptoms of nutritional disorders of chrysanthemums and gladiolus.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 383-5, bibl. 11.

Symptoms of deficiencies of Ca, B, Cu, Fe and Mn in both species are described. Paper chromatographic determination of sugars indicated larger amounts of sucrose in B-deficient than in control chrysanthemum leaves, as well as the presence of an unidentified sugar only in the B-deficient leaves. Larger amounts of amino acids were found in Fe- and Mn-deficient chrysanthemum leaves than in control leaves. [Author's summary.]—Gulf Coast Exp. Stat., Bradenton.

1074. JOINER, J. N., AND TAYLOR, J. L.
Effect of timing of nitrogen, phosphorus and potassium applications on growth and flowering of pot-grown *Chrysanthemum morifolium*, variety Humdinger.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 378-80, bibl. 1.

Chrysanthemums received the equivalent of 3 g. of a commercial 6–6–6 fertilizer per pot, but in some cases the N was applied in 1, 2 or 3 doses after pinching, the P and K being mixed with the potting soil, in others the N and K were applied in split doses with the P being mixed in the potting soil, while in a further series all 3 nutrients were applied in 1, 2 or 3 doses after pinching. There was no difference between the pre- and post-pinching application of P and K, but more vigorous growth and flowering resulted from applying the nutrients in 2 or 3 doses than in a single dose, with 2 doses being somewhat better than 3.—Univ. Fla, Gainesville.

1075. Smith, T. C., and Joiner, J. N.
The effects of varying levels of nitrogen and potassium on growth and yield of *Chrysanthemum morifolium*, variety "Bluechip".
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 430-4, bibl. 4.

A factorial experiment combining 4 levels of N and K_2O—50, 100, 200 and 400 p.p.m.—was started on 26 April and ended on 18 August, with the following growth and flowering responses determined: stem length and diameter, number of days to flowering, flower and stem weight and number, diameter and yield of flowers. Flowering responses were generally increased by K up to the third K_2O level. The highest N treatment, however, affected flowering adversely, and the only significant increases occurred between the first and second N levels. N had no effect on stem diameter, but this was increased by K up to the third K_2O level. Interactions favourably affecting stem length were evident at the first and third K_2O levels, when N was raised from the first to the second level, and at the fourth K_2O level with an increase of N from the first to the third level. Stem length was adversely affected by low K–high N treatment, and this was also detrimental to flowering. In general, the most favourable growth and flowering occurred at the second N and third K_2O levels. [From authors' summary.]—Univ. Fla, Gainesville.

1076. Lunt, O. R., Oertli, J. J., and Kohl, H. C., Jr.
Influence of certain environmental conditions on the salinity tolerance of *Chrysanthemum morifolium*.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 676-87, bibl. 7.

Experiments in controlled-temperature chambers with chrysanthemum, a plant relatively tolerant of saline conditions, showed that as the salt concentration in the nutrient solution increased from low to moderate levels the optimum growing temperature decreased. Accumulation of Na, Ca and Cl generally increased as temperatures increased.—Univ. Calif., Los Angeles.

1077. Anyos, T., and Steelink, C.
Fluorescent petal constituents of *Chrysanthemum coronarium* L.
Arch. Biochem. Biophys., 1960, **90**: 63-7, bibl. 18.

The petals of *C. coronarium* have been shown to contain the 7-glucosides of quercetin, quercetagetin and luteolin, as well as a small amount of a kaempferol glycoside. Chlorogenic and isochlorogenic acids have also been detected in moderate concentrations. [From authors' abstract.]—Univ. Ariz., Tucson.

1078. McFadden, L. A.
Control of leaf and flower diseases of florists' chrysanthemums.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 385-8, bibl. 3, illus.

Botrytis cinerea and *Ascochyta chrysanthemi* on chrysanthemums were effectively controlled by $\frac{1}{2}$ lb. maneb plus $\frac{3}{4}$ lb. captan in 100 gal. water, applied weekly on the vegetative growth and twice weekly on open flowers. Some other sprays have also given good control but either left objectionable residues or damaged the open flowers. Against bacterial leaf spot (*Pseudomonas* sp.) weekly applications of tribasic copper sulphate at 4 lb./100 gal. or Agri-mycin 500 at 3 lb./100 gal. were effective.—Sub-trop. Exp. Stat., Homestead.

1079. Brierley, P., and Lorentz, P.
Healthy tip cuttings from some mosaic-diseased Asiatic chrysanthemums; some benefits and other effects of heat treatment.
Phytopathology, 1960, **50**: 404-8, bibl. 7, illus.

Healthy tip cuttings were obtained from mosaic-infected chrysanthemums after 2 to 8 months at 35° C. These tended to grow taller and to have larger and earlier blooms of better lasting quality and with stiffer stems than corresponding mosaic-infected plants. Heating at 35° C. induced true fasciation in several varieties and devernalization in some Japanese types, but neither effect appeared in American or English varieties that received similar heat treatment. [See also *H.A.*, 28: 3928.]—U.S.D.A., Beltsville, Md.

1080. Neiswander, R. E., and Miller, R. O.
Systemic insecticides on potted mums.
Flor. Exch., 1960, **135**(5): 11, 13.

In one series of tests populations of two-spotted mites on pot chrysanthemums were reduced by soil applications of Systox, Thimet, Phosphoamidon, Dimethoate and Shell SD 3562 at most of the concentrations used, but Dimethoate and Phosphoamidon caused some foliar injury. When the plants were attacked by the flower thrips (*Frankliniella tritici*), Thimet treatments were the most effective. Plants treated with Thimet, Systox and Di-Syston showed improved flower quality. In a further trial 2 soil applications were given, and

Thimet granules seemed more effective than an emulsion.—Ohio agric. Exp. Stat., Wooster.

1081. van Zon, A. Q., Steiner, A. A., and Scholten, G.
Gerbera. [In Dutch.]
Jversl. Proefst. Bloem. Aalsmeer, 1959, pp. 62-3.

In a soilless culture experiment it was found that captan applied in the nutrient solution was effective against *Fusarium oxysporum.* The growth of plants in infected soil sterilized by Vapam was poorer than that in soil which had been steamed to control infection.

1082. Barton, L. V.
Storage of seeds of *Lobelia cardinalis* L.
Contr. Boyce Thompson Inst., 1960, **20**: 395-401, bibl. 15.

Seeds of *Lobelia cardinalis* were stored in sealed glass vials with moisture contents of 6·9 and 4·7% in atmospheres of air, oxygen, carbon dioxide, nitrogen and partial vacuum for periods of up to 25 years, at laboratory temperature and at 5° and −5° C. They were also stored in open containers at these temperatures. Viability was lost more rapidly in the laboratory than at the lower temperatures, and at the higher moisture content than at the lower. At laboratory temperature in open storage or in sealed vials in air, viability was reduced from 73 to 38 and 52%, respectively, after one year of storage, with rapid deterioration thereafter. Deterioration was even more rapid in an atmosphere of oxygen, whereas storage in carbon dioxide, nitrogen or a partial vacuum extended the life of the seeds held in the laboratory for as much as 5 or 8 years. Life span in open storage at 5° C. under very humid conditions was as short as that in the drier atmosphere of the laboratory, whereas seeds in open storage at −5° C. survived for more than 12 years. There were no differences in the response of the seeds to atmospheres of air, oxygen, carbon dioxide, nitrogen or partial vacuum at the two low temperatures in 25 years of storage. [Author's summary.]

1083. Butterfield, N. W.
Sow now for spring pansy business.
Flor. Exch., 1960, **135**(7): 11, 13.

Modern methods of raising pansies from seed-bed preparation to the sale of plants in the spring, ncluding varieties, diseases and pests.

1084. Bing, A.
Controlling weeds in pansies.
Bull. N.Y. St. Flower Grs, 1960, No. 176, pp. 1, 2, illus.

Eptam and neburon, applied in granular form to newly-transplanted pansies, have given promising results, but experience is limited. Pre-planting soil treatment with steam, methyl bromide or Vapam is recommended for weed control at present.

1085. Shannon, J., and Kamp, J. R.
Study new peony varieties for mass distribution, lower prices.
Flor. Exch., 1960, **134**(26): 11.

Leaf-bud cuttings of 4 peony varieties were rooted under intermittent mist in the greenhouse. M. Jules Elie and Claire Dubois rooted more readily than Festiva Maxima and Felix Crousse.

1086. van der Graaf, A. J.
Vergelijking van onkruidbestrijdingsmiddelen op geplante pioenen. **(A comparison of herbicides for peonies.)**
Jaarb. Proefst. Boomkw. Boskoop, 1959, pp. 80-1.

Weeds in field-planted peonies may be satisfactorily controlled with simazine sprays applied in the autumn at 1 kg./ha. and again in March at 3 kg./ha. Granular simazine, though also effective, was difficult to apply.

1087. Saxena, S. S., and Nanda, J. S.
A note on colchicine-treated phlox.
Curr. Sci., 1960, **29**: 281, bibl. 1, illus.

The treated seed showed reduced germination but the seedlings, although growing more slowly, were taller and more bushy and had thicker, coarser leaves and much larger flowers than normal. The flowering period, although delayed, was considerably prolonged.—Govt agric. Coll., Kanpur.

1088. Harrison, B. J.
Autogenous necrosis in an *Antirrhinum* species hybrid.
Nature, 1960, **187**: 527-8, bibl. 7, illus.

The necrosis in hybrids of *Antirrhinum orontium* × *A. meonanthum* appears as excrudescent, corky spots on the stems, leaves and calyces, together with occasional lesions on the stems. A study of a number of crosses indicated that the cause is nuclear-genetic, rather than cytoplasmic or of virus origin.—John Innes hort. Instn, Bayfordbury, Herts.

1089. Tayama, H. K., and Kamp, J. R.
Column stocks and companion crops. IV. Snapdragon companions for fall planted stocks.
Ill. St. Flor. Ass. Bull., 1960, No. 205, p. 5, bibl. 3.

Both Christina and Golden Spike snapdragons flowered earlier when grown at 60° or 65° F. than at 55° F., but the length and quality of the inflorescences was much better at the lower temperature, particularly in the variety Christina.

1090. Tayama, H. K., and Kamp, J. R.
Column stocks and companion crops. VI. Snapdragon companions for the spring planting of stocks.
Ill. St. Flor. Ass. Bull., 1960, No. 206, p. 4.

Snapdragons showed the same responses as in an autumn planting [see preceding abstract], with Golden Spike being of better quality, and also better able to tolerate higher growing temperatures, than Christina.

1091. Maginnes, E., and Langhans, R. W.
Day length and temperature affect initiation and flowering of snapdragons.
Bull. N.Y. St. Flower Grs, 1960 No. 171, pp. 1, 5, 6, illus.
Snapdragon initiation and flowering affected by day length, temperature.
Flor. Exch., 1960, **135**(8): 16.

Seedlings of the variety Jackpot were raised at constant temperatures of 40, 50, 60 and 70° F. and under day lengths of 9 and 18 hours. The number of days from germination to harvest was greater in the 9-hour than in the 18-hour days. Increased temperature decreased the time taken to mature. Decreasing the day length from 18 to 9 hours approximately doubled the number of leaves formed prior to the flower buds, whereas temperature had little or no effect on leaf production. In general, short days produced flowers that were one grade higher in quality than those grown under long days. Increasing the temperature from 50 to 70° F. decreased flower quality in 18-hour days but did not affect quality in 9-hour days.

1092. Miller, R. O.
Growth and flowering of snapdragons as affected by night temperatures adjusted in relation to light intensity.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 761-8, bibl. 9, illus.

See *H.A.*, 29: 1687.

1093. Flint, H. L.
Relative effects of light duration and intensity on growth and flowering of winter snapdragon (*Antirrhinum majus* L.)
Proc. Amer. Soc. hort. Sci., 1960, **75**: 769-73, bibl. 3.

The effects of light duration and intensity on dry matter production in snapdragon seedlings and on growth and flowering of older plants were studied in light- and temperature-controlled chambers [for earlier work, see *H.A.*, 29: 3877]. Warm-white fluorescent lamps were used, and light intensities of 200, 400, 800 and 1,600 f.c. were maintained for durations of 6, 12 and 24 hours. Seedlings were grown in the 12 combinations of these duration and intensity treatments, and samples of plants were taken for dry weight measurements at the end of 3, 6 and 10 days. Some plants were grown under certain of these treatments until maturity. This experiment showed that a given amount of light applied over long daily durations produced more dry matter than when applied over shorter durations. Light saturation of photosynthesis was not a limiting factor. Longer durations at all total light levels also resulted in greater leaf area and stem elongation. Plants grown under the 6-hr. duration had not formed visible flower buds after 5 months. [Author's summary.]—Cornell Univ., Ithaca, N.Y.

1094. Schmidt, H., and Böhme, H.
Zur Untersuchung der Blüteninhaltsstoffe von *Antirrhinum majus*. **(Investigations on flower composition in *Antirrhinum majus*.)**
Biol. Zbl., 1960, **79**: 423-5, bibl. 6.

Work at Gatersleben on flower pigments.

1095. Teas, H. J., Sheehan, T. J., and Holmsen, T. W.
Control of geotropic bending in snapdragon and gladiolus inflorescences.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 437-42, bibl. 3, illus.

Geotropic bending in cut snapdragons was successfully prevented by N-1-naphthylphthalamate (NP) and was also inhibited by gamma radiation between 7·5 Kr and 20 Kr. When gladioli were treated with NP and 8 other chemicals, in no case was the result sufficiently effective for commercial use. [See also *H.A.*, 30: 4174.]—Fla agric. Exp. Stat., Gainesville.

1096. Tayama, H. K., and Kamp, J. R.
Column stocks and companion crops. II. Responses of two stock varieties to fall flowering.
Ill. St. Flor. Ass. Bull., 1960, No. 204, pp. 4-5.

Seedlings of the varieties Ball Apricot and Ball White were divided into 3 groups, that were provided from sowing on October 28 with night temperatures of 55°, 60° and 65° F. Twenty-nine days after sowing, each group was further subdivided into 3, ⅓ staying at the same temperature and the others being switched to 1 of the other 2 temperatures, giving 9 treatments in all for each variety. It was found that a high initial temperature retarded bloom in both varieties. Studies were made of stem length, inflorescence length, flower and bud counts and weight of stems. Ball White required a somewhat cooler temperature than Ball Apricot for earliest and best production. Whereas in an earlier trial [*H.A.*, 30: 5844] spring planted Ball Apricot plants sown on 10 February developed best when held at a constant temperature of 60° F., the autumn-sown plants grew and flowered best when started at 55° and finished at 60° F.

1097. Tayama, H. K., and Kamp, J. R.
Column stocks and companion crops. III. Interpretation of peat pot effects on column stocks.
Ill. St. Flor. Ass. Bull., 1960, No. 205, pp. 4-5.

Two varieties of stocks were sown in greenhouse enches and also in peat pots on Oct. 26. There were no significant differences between the two lots n the time taken to flower, average stem length, lower number and plant weight. The plants aised in the benches did have longer inflorescences, ut the differences were not very great.

098. Tayama, H. K., and Kamp, J. R.
Column stocks and companion crops. V. A second spring flowering of stocks.
Ill. St. Flor. Ass. Bull., 1960, No. 206, pp. 3-4, bibl. 4.

n a trial with a spring sowing of 2 varieties of stocks Ball Apricot showed the same temperature responses s in earlier autumn and spring trials [see *H.A.*, 0: 5844], the best results being obtained at a growing temperature of 60° F. The variety Ball White, however, did not show the same preference for a low temperature (55° F.) as it had done when own in the autumn.

099. Tsukamoto, Y., and Konishi, K.
Effect of light during vernalization on flowering of stocks (*Mathiola incana*). [In English.]
J. hort. Ass. Japan, 1960, **29**: 70-5, bibl. 18, illus.

Continuous lighting during chilling at 10° C. resulted in a high percentage of budding and flowerng, whereas artificial short-day (8 hours) conditions resulted in a low percentage. Continuous light provided before vernalization increased flower bud formation more than did short-day treatment.

1100. Büttner, G.
Der Einfluss verschiedener photoperiodischer Behandlung auf Entwicklung und Ertrag der Edelwicke. (**The effect of different photoperiodic treatments on the development and yield of sweet peas.**) [Russian and English summaries 17 lines each.]
Arch. Gartenb., 1960, **8**: 311-20, bibl. 8.

The experiments described were carried out in a glasshouse in winter, sweet pea seeds being sown (a) in a dry condition, (b) after 24 hours' soaking and (c) after 21 days vernalization (at 3° C.). The plants were grown both in natural short days and in artificial long days (220 lux from 1 a.m. until dawn), and these treatments were reversed at fortnightly ntervals. The transition from short days to long days accelerated flowering by an average of 48 days, a relatively long long-day treatment being more favourable than a shorter one. Vernalization accelerated flowering by 8 days. Earlier flowering was associated with a lower number of inflorescences and fewer flowers with shorter stems. Soaking the seeds in tap water for 24 hours increased the number of inflorescences without delaying flowering. The adoption of this simple method is recommended to the grower.—Inst. Gartenb. Dresden-Pillnitz.

1101. Bivins, J. L.
Weed control in sweet pea seed crop at Lompoc.
Calif. Agric., 1960, **14**(5): 11.

Successful weed control was obtained when the soil was sprayed, immediately after planting, with neburon and CDEC.

1102. Reichel, L., and Hiller, W.
Über die Farbstoffe der Wicke. (**On the flower pigments of the sweet pea.**)
Naturwissenschaften, 1960, **47**: 83-4.

Of the eleven anthocyanins found in the sweet pea variety Valencia seven were identified.

1103. Venkataramani, K. S.
Powdery mildew of garden verbena.
South Indian Hort., 1958, **6**: 122-3, bibl. 4.

Oidium verbenae, growing on *Verbena erionoides* and *V. hybrida* in the Nilgiris, was found itself to be infected with the fungal hyperparasite *Cicinnobolus cesatii*.

1104. Simmonds, N. W.
Flower colour in *Lochnera rosea*.
Heredity, 1960, **14**: 253-61, bibl. 11.

In *Lochnera* (*Vinca*) *rosea* flower colour is controlled by 4 major genes. A and R are complementary basic colour genes, W is concerned with pattern and B is a copigmentation gene. Five main phenotypes may be recognized, violet, pink, eye, flush and white. Flower colour variation is primarily due to variation in rates of development and distribution of pigment and to copigmentation rather than to chemical variation in the pigment itself.—Imp. Coll. trop. Agric., Trinidad.

1105. Forsberg, J. L.
Zinnia diseases.
Ill. St. Flor. Ass. Bull., 1960, No. 204, pp. 6-7, bibl. 2, illus.

Symptoms and control measures for powdery mildew (*Erysiphe cichoracearum*) and alternaria blight (*A. zinniae*).

1106. Prota, U.
Esperienze intorno alla trasmissione di *Alternaria zinniae* Pape mediante i semi di zinnia e saggi di disinfezione dei medesimi. (**Seed transmission of *Alternaria zinniae* and seed disinfection trials.**) [English summary 9 lines.]
Not. Mal. Piante, 1960, No. 52, pp. 119-30, bibl. 7, illus.

In Italy zinnia seed is usually infected by *A. zinniae*. Control was achieved with 2 organo-mercury compounds, one of which, however, was toxic to the seedlings, and with zineb. Hot water treatment at 51–52° C. was of no use.—Ist. Pat. veg., Univ. Sassari.

Bulbs, tubers, etc.

(*See also* 14, 1072, 1073, 1095.)

1107. Hanák, B.
Některé nové poznatky o šlechtění, pěstování a produkci cibulovitých květin v ČSR. **(New data on the breeding, cultivation and production of flower bulbs in Czechoslovakia.)** [Russian and German summaries 6 lines each.]
Acta Univ. Agric., Brno, Ser. A, 1959, Special No., pp. 45-50.

Conditions in some areas as suitable as those in Holland.

1108. Mus, D.
Wat te doen met afgewerkte ziektebestrijdingsmiddelen? **(What should be done with disease-control materials after use?)**
Weekbl. BloembollCult., 1960, **71**: 5.

Experiments were carried out on the disposal of mercurial products used for bulb disinfection. The procedure recommended for preventing contamination of surface water involves digging a pit with twice the capacity of the probable contents, at least 3 m. from the nearest water supply. The floor of the pit should be kept permeable.—Hoogheemraadschap van Rijnland.

1109. Cayrol, J.-C.
Les *Tagetes*. Nouveaux nématicides. **(Species of *Tagetes* produce new nematicides.)**
Rev. hort. Paris, 1960, **132**: 2272, illus.

A brief summary of Dutch work on nematode control in bulb crops by green manuring or intercropping with African marigolds (*Tagetes* spp.).

1110. Langedijk, G. J., and Veerman, J. A.
De bloembollenrooiers. **(Bulb lifting machines.)**
Weekbl. BloembollCult., 1960, **71**: 1-4, illus.

Developments and improvements are discussed and illustrated by descriptions of 5 models.

1111. Edwards, C. A., and Dennis, E. B.
Observations on the biology and control of the garden swift moth.
Plant Path., 1960, **9**: 95-9, bibl. 1, illus.

Soil drenches of 20% DDT emulsion gave good control of *Hepialus lupulinus* on anemones and lettuces.—N.A.A.S., Bristol.

1112. van Zon, A. Q., Steiner, A. A., and Helle, W.
Anthurium. [In Dutch.]
Jversl. Proefst. Bloem. Aalsmeer, 1959, pp. 31-9.

In soilless culture the growth and flowering of anthuriums were better in fine than in coarse gravel, and were best in ground pumice. Plants growing in warm conditions (minimum day temperature 25° C.) produced considerably more flowers than those growing at 20° C. Flower production and quality were better in gravel culture than in soil. Gusathion and Phosdrin were both effective for controlling *Coccus hesperidum.*

1113. Bik, R. A., and Scholten, G.
Cyclamen. [In Dutch.]
Jversl. Proefst. Bloem. Aalsmeer, 1959, pp. 48-59, illus.

The growth of young plants was favoured by a low pH of the potting compost (pH 5·5–6·0). Farmyard manure had a good effect on cyclamen growth, and during the last 3 months of the growing period the optimal amount increased from 7·5% to 22·5% (volume). In trials with several potting mixtures an increase in the proportion of peat moss or turf resulted in improved growth during the early months, but later this tendency was reversed and mixtures containing humus-rich materials were less favourable. Cyclamen were less sensitive to the ash content of the potting soil throughout the growing period than had been supposed. In an experiment for the preventive control of *Cylindrocarpon* young plants made such good growth in a steamed soil that an unsteamed soil could be used for potting up; both captan and TMTD mixed with steamed soil largely controlled an artificial infection, and a rate of $\frac{1}{2}$ kg./cu. m. of soil was adequate; in unsteamed soil containing root pieces from infected plants, no remedy tried was effective; the use of TMTD resulted in a deeper leaf colour, but at 1–2 kg./cu.m. soil growth inhibition was apparent, and therefore captan is preferred.

1114. Jansen, H.
Gibberellin-Anwendung bei Cyclamen. **(The application of gibberellin to cyclamen.)**
Gartenwelt, 1960, **60**: 231-2, bibl. 1, illus.

Cyclamen plants were sprayed with the GA preparations Gibboe and Gibboe konz., which contain 10 and 50 mg. of active ingredient, respectively. One litre of liquid sufficed for about 100 plants. The best results were obtained when the treatment was carried out during the extension growth of the first buds, i.e. when these were 1–2 cm. long; but as it is difficult to time the sprays correctly for a whole batch of plants the grower is advised to give 3 applications. In one of the experiments the plants were sprayed with Gibboe solution on 12, 19 and 26 September. The figures presented indicate that flowering was advanced by an average of 14–18 days. In addition, the number of flower buds opening simultaneously was much increased.—Inst. Bot., tech. Hochsch., Hannover.

1115. Walther, A.
Brunissure des racines du cyclamen. **(Browning of cyclamen roots.)**
Rev. hort. suisse, 1960, **33**: 172-3, illus.

Thielaviopsis basicola on roots of potted cyclamen is at present treated by watering with 0·5%

Orthocide after each repotting and at 3-week intervals after the final potting. Experiments with other treatments are in progress.

1116. Everett, H. J.
A note on breeding red freesias.
J. roy. hort. Soc., 1960, **85**: 272-3, illus.

1117. Kosugi, K.
Studies on blindness in gladiolus. VI. Effects of fertilizer treatment on flowering in gladiolus.
[Japanese, with English summary ½ p.]
J. hort. Ass. Japan, 1960, **29**: 77-82, bibl. 19.

Gladiolus corms planted in sand were supplied with 3 levels of N and 2 each of K and P. No significant differences were observed in percentage of flowering, height of plants, number of leaves and number of florets. Early flowering occurred in plants receiving the higher amounts of N and P, and later flowering where no N was given. N deficiency was noted in the plants receiving little or no N, and poor root development in those receiving high N. The fresh weight of tops and new corms increased with increasing N, but the number of cormels was greater at low N and decreased markedly at the highest N level. Increasing the P level increased both P and N absorption. For nutrient solutions 100 p.p.m. N is recommended. [For Part V, see *H.A.*, 30: 4200.]

1118. Halevy, A.
Diurnal fluctuations in water balance factors of gladiolus leaves.
Bull. Res. Coun. Israel, Sect. D, 1960, **8D**: 239-46, bibl. 34.

Hourly determinations were made of transpiration, stomatal aperture, water saturation deficit, osmotic values, water content and meteorological factors. The daily curve of transpiration generally followed that of the main meteorological factors, and the rate of transpiration was positively correlated with stomatal apertures up to a width of 4 microns. The stomata of the 2 lower leaves showed a surprising tendency to open before midnight after having closed earlier in the night. The water saturation deficit of the 4th leaf was always higher than that of the 3rd. Osmotic values during the day were positively correlated with the saturation deficit and negatively with the water content. The most suitable time to test the leaf water balance was 3 hours after sunrise.—Hebrew Univ., Rehovoth.

1119. Compton, O. C., and Remmert, L. F.
Effect of air-borne fluorine on injury and fluorine content of gladiolus leaves.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 663-75, bibl. 11.

Leaf F and leaf scorch were determined on several varieties of gladiolus grown in industrial and non-industrial areas in north-west Oregon. Abnormally high F concentrations were found in leaves collected as far as 9 miles down-wind from an aluminium factory, the major source of air-borne F in the area. There was a wide range in sensitivity to F burn among the several varieties tested, the least sensitive containing the most F. Within a variety the amount of leaf scorch was generally closely correlated with the F content. The F content decreased from tip to base of leaves treated with hydrofluoric acid or exposed near F-emitting industries. The tip 3 inches of such leaves contained 5–10 times as much F as the next 3-inch portion. The fourth leaf from the base of the plant was usually the most indicative of the presence of air-borne F. [Authors' summary.]—Ore. St. Coll., Corvallis.

1120. Compton, O. C.
Effects of leaf clipping upon the size of gladiolus corms.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 688-92, bibl. 7.

In order to determine to what extent corm size is likely to be affected by fluorine injury to the leaves of gladiolus, the tips of mature leaves of the Beacon and Picardy varieties were cut back 2, 4, 6 or 8 inches, either periodically as each leaf matured or once only at spike emergence. Corm weights were reduced in proportion to the severity of the clipping, the effect being more severe on Beacon than on Picardy. In the Beacon variety removal of 8 inches of the tip reduced corm weights by 46% with periodic clipping and by 31% with a single clipping. Significant reductions in corm weight were obtained only after about 11% of the total leaf area of the plant had been removed.—Ore. St. Univ., Corvallis.

1121. Burgis, D. S.
Pre- and post-emergence herbicides for gladiolus.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 362-4, bibl. 5.

The results of recent trials on 5 gladiolus varieties, which are described here, confirmed earlier findings. Karmex DW, either at 1 lb./acre pre-emergence and 1 lb. at lay-by or at 2 lb./acre at lay-by, is currently recommended for weed control in flowering gladioli. If, however, corms are smaller than size 4 Sesone is preferable. Simazine (50%) at 1 lb./acre pre-emergence and 1 lb. at lay-by and Eptam at 6 lb./acre pre-emergence and 6 lb. at lay-by are recommended for growers' trials, especially where nutgrass is a problem.—Gulf Coast Exp. Stat., Bradenton.

1122. Schenk, P. K.
Hardrot van gladiolen, veroorzaakt door *Septoria gladioli*. (**Hard rot of gladioli, caused by *Septoria gladioli*.**) [English summary 1 p.]
Tijdschr. PlZiekt., 1960, **66**: 205-27, bibl. 25, illus.

Factors affecting the spread of primary and secondary infections of corms and cormels were investigated. Very good control of primary infections was obtained in the case of corms by a preplanting dip in organic mercurials, and in cormels by hot water treatment at 53° or 55° C. for half an hour. The spread of secondary infections in the field was prevented by spraying with a mixture of zineb and maneb.—Lab. BloembollOnderz., Lisse.

1123. GOULD, C. J.
Soil treatment test for control of *Stromatinia* dry rot of gladiolus in 1958.
Bull. N. Amer. Gladiolus Coun., 1959, **59**: 1-13, from *Biol. Abstr., Sect. D*, 1960, 35, Abstr. 25,263.

When thiram and 3 proprietary compounds were applied to the corms and soil the best control was given by thiram, but because of its price planting on new land is a more practical solution for commercial growers.—W. Wash. Exp. Stat., Puyallup.

1124. KLAUS, K.
Ratsuritähe aretamisest Eesti NSV-s. (**The improvement of hippeastrum in the Estonian S.S.R.**) [English and Russian summaries ⅓ p. each.]
Toim. Tead. Akad. Eesti NSV, biol. Ser., 1960, **9**: 131-4, illus.

Hybrids that are dark red, light red, white, red with white stripes and white with red stripes have been developed, some with flowers 24 cm. in diameter.

1125. HYLANDER, N.
The genus *Hosta*.
J. roy. hort. Soc., 1960, **85**: 356-66, illus.

Descriptions of 13 species.

1126. BOOTH, V. H., AND CONSTABLE, B. J.
Stability of ascorbic acid in extracts of iris leaves.
Biochem. J., 1960, **76**: 206-8, bibl. 19.

Some of the highest leaf ascorbic acid concentrations recorded were found in several batches of different varieties of Iridaceae. The average was 4·0 mg. per g. fresh wt. or 31 mg. per g. dry wt. On a dry weight basis the concentration was greatest near the base and least at the leaf apex, but on a fresh weight basis it was similar throughout the length of the leaf. The oxidase activity of the leaf towards ascorbic acid was exceptionally low. [From authors' summary.]—Dunn nutrit. Lab., Cambridge.

1127. BAKKER, J., AND BIK, R. A.
Lelies. (**Lilies.**)
Jversl. Proefst. Bloem. Aalsmeer, 1959, pp. 66-83.

Croft lily bulbs potted in a layer of sand (above the compost) flowered a week earlier than those planted directly in the compost. The flowering of forced Orange Triumph lilies following chelate treatment in the field was less than that of non-treated bulbs. In trials with *Lilium regale* the best storage results with bulbs of 20/22 riddle were obtained with 10 days at 9° C., followed by 40 days at 2° C.; the best temperature for forcing was 15° C. with a soil temperature about 10° C.; the occurrence of split calyx was not affected by 5 or 10 days at 17° or 9° C.; bulbs of 20/22 riddle produced the most flowers; 4-year-old bulbs produced fewer flowers per bulb than did 3-year-old bulbs. After storage at ½° C. the forcing quality of *L. regale* was not much lower than after storage at 2° C. Early lifting of bulbs (*L. regale*) before forcing is not recommended, as such bulbs produced fewer flowers up to 15 days later than those lifted in November; however, storage of early-dug bulbs at 2° C. until the end of January improved their flowering quality. Bulbs of both *L. regale* and *L. pumilum* which had been allowed to produce seed were not satisfactory for forcing. Supplementary lighting with fluorescent lamps during forcing of *L. regale* did not favour flowering, although there was a slight improvement with *L. speciosum rubrum*. The use of CIPC for weed control in the field reduced both stem length and flower number per stalk in *L. speciosum rubrum*.

1128. EMSWELLER, S. L., AND UHRING, J.
Breeding *Lilium longiflorum* at the tetraploid level.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 711-19, bibl. 16, illus.

With colchicine treatment.

1129. PERSHAD, G. D.
Cytological aberrations of *Lilium* microsporocytes after gamma irradiation at pachytene and diakinesis.
Diss. Abstr., 1960, **20**: 4494, being *L.C. Card No. Mic.* 60-1832 of 112 pp.

Radiation damage was studied following exposure of *Lilium* sporocytes to Co^{60} gamma irradiation. Four horticultural varieties of *L. longiflorum* were included in the study.—Ia St. Univ. Sci. Tech.

1130. EMSWELLER, S. L., UHRING, J., AND STUART, N. W.
The roles of naphthalene acetamide and potassium gibberellate in overcoming self-incompatibility in *Lilium longiflorum*.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 720-5, bibl. 5, illus.

Naphthalene acetamide used at time of pollination delayed senescence of the embryo sacs for the 26-day period of these tests, at which time ovules in the untreated capsules were completely shrivelled. Pollen tubes were observed in the micropyle of several embryo sacs 17 days after pollination. Capsules from treated pollinations increased in length and diameter during the 26-day period. An initial increase in growth of untreated capsules was halted after 12 days and such capsules decreased in length and diameter during the remainder of the investigation. A few seeds were obtained from untreated pollinations and from those treated with gibberellate. The use of naphthalene acetamide alone or in combination with potassium gibberellate greatly increased seed set. [Authors' summary.]—U.S.D.A., Beltsville, Md.

1131. Nasatir, M., Bryan, A. M., and Rodenberg, S. D.
Changes in soluble proteins of developing lily anther.
Science, 1960, **132**: 897-8, bibl. 9.

One of the 4 electrophoretic components of the extract increases in amount before mitosis and disappears at mitosis; two of the components have peak values at the time of mitosis and decrease thereafter; a fourth component remains relatively constant in amount throughout. [From authors' abstract.]—Univ. Pa, Philadelphia.

1132. Forsberg, J. L.
Lily diseases.
Ill. St. Flor. Ass. Bull., 1960, No. 203, pp. 1, 3-5, bibl. 40, illus.

Symptoms and control measures are outlined for the following: mosaic, rosette or yellow flat, fleck, botrytis blight, root rot, fusarium or basal rot, rhizopus bulb rot, blue mould bulb rot, black scale, scale tip rot, scorch, leaf burn, tip burn, stem rot, rust, dieback and bunchy top.

1133. D'Herde, J., van den Brande, J., and Gillard, A.
Control of *Pratylenchus penetrans* (Cobb), causal agent of rootrot in lilies. [French summary 9 lines.]
Nematologica, Suppl. II, Rep. 5th int. Sympos. Plant Nemat., 1959, Uppsala, 1960, pp. 64-7, bibl. 4, illus.

Investigations show that stock bulbs of *Lilium speciosum* possessing roots which have not shrivelled may spread the disease. Hot-water treatment at 46° C. for 20 minutes controlled the nematode.—RijkslandbHogesch., Gent, Belgium.

1134. Kragtwijk, C.
Ornithogalum. [In Dutch.]
Jversl. Proefst. Bloem. Aalsmeer, 1959, pp. 84-7.

Flower production from *Ornithogalum thyrsoides* spaced at 30 × 8 cm. was better than in plants set at wider or closer spacings or at the same density with square spacing. Zineb and TMTD, both at 3 g. per 50 bulbs, showed promise for the treatment of *Penicillium*-infected bulbs. Storage at 25° C. was better for imported bulbs than storage at 30° C., which resulted in flower abnormalities, reduced flowering and shorter stalks.

1135. Szalay, F.
Tulipán terméstechnikai kísérletek. **(Trials on tulip growing.)** [Russian and German summaries 1 p. each.]
Kísérl. Közlem., Sect. C., 1959 (issued 1960), **52C**(3): 73-92, bibl. 3.

The effects were studied of flowering and spacing on bulb production in tulips. Removal of the flower immediately on opening produced good bulbs for forcing, the retention of the green flower stalk increasing bulb weight by more than 20%. Of 5 spacings tried 30 × 10 cm. was the most economical and was adequate for good bulb development.

1136. Anon.
Zure tulpen. **("Sour" tulips.)**
Weekbl. BloembollCult., 1960, **70**: 951.

For the 2 varieties of tulip investigated the incidence of *Fusarium oxysporum* infection was very greatly increased by soil heating. In 3 other varieties it was distinctly higher in sandy than in clay soil. Brief advice is given on the avoidance of infection by correct cultural practices, harvesting and storage.

1137. Boerema, G. H.
De oorzaak van "zwartbenigheid" bij tulpen. **(The cause of black leg in tulips.)** [English summary $\frac{2}{3}$ p.]
Tijdschr. PlZiekt., 1960, **66**: 232-4, bibl. 3.

A new disease of tulips, irises and crocuses, affecting the flower stalk and the old and new bulbs, is probably caused by a species of *Sclerotinia*. The disease can be controlled by a pre-planting treatment of the bulbs with pentachloronitrobenzene, tetrachloronitrobenzene or an organic mercury compound. Infected soil should be disinfected with pentachloronitrobenzene. [See also *H.A.*, 30: 1030].—PlZiekt. Dienst, Wageningen.

Lawns and sports turf.

1138. Jackson, N.
Evaluation of some grass varieties.
J. Sports Turf Res. Inst., 1960, **10**: 13-28.

Observations were carried out on 46 varieties of 13 species sown in 2 blocks, one containing coarser leaved species mown at $\frac{7}{16}$ in., and the other fine leaved species mown at $\frac{3}{16}$ in. Differences in establishment, susceptibility to disease, winter hardiness, colour and texture were noted.

1139. Sutton, M. A. F.
Agrostis stolonifera.
Turf for Sport, reprinted in *Park Administ.*, 1960, **25**: 27-34, illus.

Turf production by planting stolons examined in some detail.

1140. Bradshaw, A. D.
Studies of variation in bent grass species. II. Variation within *Agrostis tenuis*.
J. Sports Turf Res. Inst., 1960, **10**: 6-12, bibl. 7, illus.

The considerable amount of variation found both within populations and between populations in different areas, which is described in this paper, indicates that there is much scope for developing improved strains by breeding and selection. [For part I, see *H.A.*, 29: 3897.]—Univ. Coll. N. Wales, Bangor.

1141. Langmead, L. B.
A lawn plant for shade.
Gdnrs' Chron., 1960, **148**: 111, illus.

Cotula squalida can make a satisfactory lawn in deep shade.

1142. Miller, V. J.
Temperature effect on the rate of apparent photosynthesis of seaside bent and Bermudagrass.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 700-3, bibl. 9.

The relative rate of apparent photosynthesis at 6 temperatures (15°, 20°, 25°, 30°, 35°, 40° C.) was measured at the same CO_2 range, approximately 300 p.p.m., for common Bermudagrass (*Cynodon dactylon*) and seaside bent (*Agrostis palustris*). The relative rate for bentgrass increased from 64·6% at 15° C. to a maximum of 100% at 25°, then decreased to 62·2% at 40° C. The relative rate for Bermudagrass increased from 54·9% at 15° C. to a maximum of 100% at 35° and dropped to only 97·7% at 40° C. [Author's summary and conclusions.]—Ariz. St. Univ., Tempe.

1143. Goetze, N. R.
Heavy nitrogen fertilization of cool season turf grasses.
Diss. Abstr., 1960, **21**: 2-3, being *L.C. Card No. Mic.* 60-2203 of 86 pp.

Natural organic materials produced ryegrass turf of better visual quality than either soluble or ureaformaldehyde fertilizers at comparable rates. On a creeping bentgrass putting green soluble and organic fertilizer N had a better effect on quality than comparable amounts of ureaformaldehyde. No differences in Merion bluegrass quality were observed in these experiments. Density of ryegrass turf was not affected by N source, but was improved by increasing rates of N. Organic materials gave better mechanical supporting ability to ryegrass turf than other fertilizers. Dry weight yields of ryegrass mowings responded directly to the amount of N applied, with organic materials giving a better response than inorganic fertilizers applied at comparable rates. Ureaformaldehyde materials produced a more uniform yield than other materials. No differences in yield of Merion bluegrass mowings were found between 4, 8 and 20 lb. N per 1,000 sq.ft. The N content of ryegrass and bentgrass putting-green mowings varied with fertilizer rates. Deficiency signs appeared at 3% N in ryegrass mowings and at 2·8% N in bentgrass mowings. The amount of N recovered in ryegrass mowings varied from 33% of that applied in the soluble form to 17% of the ureaformaldehyde applied. After 3 years of heavy N fertilization, Merion bluegrass turf soils had accumulated large amounts of N in the top inch of soil especially from ureaformaldehyde materials. The carbon content of these soils at the surface was not affected by fertilizers.—Purdue Univ.

1144. Madison, J. H., Jr.
The mowing of turfgrass. I. The effect of season, interval, and height of mowing on the growth of seaside bentgrass turf.
Agron. J., 1960, **52**: 449-52, bibl. 2.

Regrowth of mowed turf of *Agrostis palustris* consisted of 2 phases, namely elongation of cut leaves for approximately 4 days and then the production of new leaves. Dry weight production per day increased as the interval between cuts increased and was affected by the season and height of cut. During cool weather colour was little affected by mowing practice, but during hot weather both interval and height were important, the best colour occurring at higher cuts and from cuts at intervals greater than 3 days. A 5-day interval between mowings of bentgrass is suggested.—Univ. Calif., Davis.

1145. Bartle, W. H.
New machinery.
J. Sports Turf Res. Inst., 1960, **10**: 61-72, illus.

New mowers and sprayers for use on turf described.

1146. National Weed Committee, Eastern Section.
[Weed control in] turf.
Res. Rep. east. Sect. nat. Weed Cttee Canada, 1959, pp. 110-14.

This is an outline of 10 reports dealing with the control of a large number of turf weeds, including *Cerastium vulgatum*, *Trifolium* spp., *Plantago* spp. and *Digitaria* spp.—See *Weed Abstr.*, **9**, No. 954.

1147. Kates, A.
Lawn weed control.
Circ. Va polytech. Inst. **820**, 1960, pp. 4, illus.

Recommendations for the use of herbicides on common weeds.

1148. Escritt, J. R.
Electrical soil warming as an anti-frost measure for sports turf—a further report.
J. Sports Turf Res. Inst., 1960, **10**: 29-41.

Observations made over a period of 6 years are reported. An electrical loading of 10 watts/sq. ft. to be used occasionally during the winter is recommended, with warming wires placed 6 in. deep and 6–9 in. apart. [From author's summary. For previous report, see *H.A.*, 25: 3123.]

1149. KREITLOW, K. W., AND JUSKA, F. V.
Lawn diseases: how to control them.
Home Gdn Bull. U.S. Dep. Agric. **61**, 1960, pp. 16, illus.

Symptoms and control measures are given for helminthosporium leafspot and foot rot, fading out, brown patch, rust, pythium diseases, dollar spot, snow mould, mushrooms and fairy rings, and slime moulds. Other causes of poor turf are discussed, and management practices which help to prevent lawn diseases are listed.

1150. JACKSON, N.
Turf disease notes, 1959.
J. Sports Turf Res. Inst., 1960, **10**: 47-53.

Fusarium patch disease, corticium disease, dollar spot, ophiobolus patch disease, fairy rings, *Colletotrichum graminicola* infection, superficial rings (caused by an unnamed basidiomycete), *Helminthosporium* spp. and nematodes, with notes on control measures found effective.

1151. SMITH, J. D.
Turf diseases in the north of Scotland.
J. Sports Turf Res. Inst., 1960, **10**: 42-6, bibl. 2.

Notes on 10 fungus diseases. Fusarium patch disease was prevented by both inorganic and organic mercury fungicides. Powdery mildew responded to Karathane at 1½ oz. in 2 gal. per 100 sq. yd.

1152. ROBERTS, E. C., SHURTLEFF, M. C., AND GUNDERSON, H.
Stop lawn pests.
Ia Fm Sci., 1960, **14**(12): 3-6, illus.

Maintenance of lawns and the control of weeds, diseases and pests discussed.

1153. GOODEY, B.
Gall-forming nematodes of grasses in Britain.
J. Sports Turf Res. Inst., 1960, **10**: 54-60, bibl 23, illus.

Notes on *Anguina agrostis*, *A. graminis*, *Ditylenchus graminophilus* and *D. radicicola*, with the grass species attacked by each and the injury caused.

Foliage and succulent plants.

(*See also* 72, 73, 109, 1629, 1630, 1637.)

1154. BIEKART, H. M., AND OTHERS.
Care of house plants.
Ext. Bull. Rutgers St. Univ. N.J. **337**, 1960, pp. 15, illus.

Environment, propagation, care, pest and disease control.

1155. GRUIS, J. T., AND JOINER, J. N.
Effect of various pots and rooting methods on the growth of *Philodendron oxycardium* and *Peperomia floridiana aurea.*
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 369-73, bibl. 3.

Cuttings were rooted and grown on in organic, clay and aluminium pots or were first rooted in greenhouse benches and then transplanted into the pots. There was little difference between plants grown in organic and clay pots and they produced significantly more growth than those grown in aluminium pots. *Philodendron oxycardium* plants made the most growth when rooted directly in organic pots, although the greatest bud elongation occurred in plants that were rooted in benches and grown on in clay pots. *Peperomia floridiana* plants rooted directly in pots produced more green weight and volume than plants rooted in benches. The dry weight of neither species was affected by the method of rooting.—Univ. Fla, Gainesville.

1156. TAYLOR, J. L., JOINER, J. N., AND DICKEY, R. D.
Nitrogen and light intensity requirements of some commercially grown foliage plants.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 373-5, bibl. 6.

In continuation of earlier experiments [see *H.A.*, 29: 2780] *Philodendron oxycardium*, *P. micans* and *Scindapsus aureus* were grown with 3 N levels (90, 1 80 and 1,360 p.p.m.) at 3 light levels (10, 40 and 70% of full sunlight). Leaf colour was generally darker at the high N levels and lighter at high light levels. Leaf area of *P. oxycardium* and *S. aureus* was increased with increasing N and decreased with increasing light during both the second and third growth phases, and leaf area of *P. micans* was increased with increasing N during the third growth phase. Stem length and number of nodes of *P. oxycardium* were affected by a nitrogen × light interaction during the second phase. Stem length of *P. micans* during the third phase was reduced by increased light intensity, and stem length of *S. aureus* was increased by increased N. Stem diameter of *S. aureus* was increased during the second phase by increased N. [From authors' summary.]—Fla agric. Exp. Stat., Gainesville.

1157. STATENS FORSØGSVIRKSOMHED I PLANTEKULTUR.
Forsøg med handelsgødninger til stueplanter 1957-58. **(Experiments on the application of commercial fertilizers to house plants, 1957-58.)**
Tidsskr. Planteavl, 1960, **64**: 181-4.

Results of tests with 15 products on 10 species tabulated and discussed briefly.

1158. CORNILLIE, E.
Le fatshedera de Lizé (*Fatshedera lizei*). **(The fatshedera of Lizé (*Fatshedera lizei*).)**
Bull. hort. Liège, 1960, **15**: 231, illus.

A brief note on an ornamental hybrid derived from *Fatsia japonica* var. *moseri* × *Hedera helix* var. *hibernica*.

1159. LEATHERMAN, S.
Ferns in cultivation, I.
Amer. Fern J., 1959, **49**: 116, from *Biol. Abstr., Sect. D*, 1960, **35**, Abstr. 39,346.

Potted ferns grow better if the potted plants are placed inside larger clay pots and the space between the 2 pots is packed with sphagnum.

1160. JOINER, J. N., AND WENTZEL, R. E.
Rooting and bud growth responses of *Philodendron oxycardium* to various levels of 3-indolebutyric acid, naphthaleneacetic acid and sucrose.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 375-7, bibl. 1.

Single-eye leaf-stem cuttings of *P. oxycardium* were soaked for 6 hours in sucrose solutions of 0, 0·15 and 0·50 M concentrations and were then immediately dipped for 6 seconds in IBA or NAA solutions at 0, 100, 300, 750 and 1,500 p.p.m. The higher concentrations of both growth substances generally inhibited bud development and subsequent growth. The first increment of sucrose increased root length and bud break, but the second increment proved inhibiting. As the concentration of growth substances increased, the higher levels of sucrose partially offset their inhibiting effect, except where 1,500 p.p.m. was used.—Univ. Fla, Gainesville.

Orchids.

(*See also* 1672.)

1161. CORBETT, M. K.
Chlorotic ringspot on *Vanda* orchid caused by *Cymbidium* mosaic virus.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 398-403, bibl. 20, illus.

The cause of chlorotic ringspot disease of *Vanda rothschildiana* was identified as *Cymbidium* mosaic virus (CyMV). The disease is believed to be distinct from other virus diseases of *Vanda* orchids. Control by protection and sanitation is recommended. [From author's summary.]—Fla agric. Exp. Stat., Gainesville.

Roses.

(*See also* 95.)

1162. OLIVER, R. W.
Garden rose growing.
Publ. Canada Dep. Agric. **908**, revised 1960, pp. 23, illus.

Culture, hardiness and winter protection, propagation, varieties and species for Canadian conditions.

1163. MARANI, C.
Importanza della coltura della rosa. (**The importance of rose growing.**)
Progr. agric., 1960, **6**: 700-9, illus.

Varieties, production and trade in Italy.

1164. VAN MARSBERGEN, W., BIK, R. A., AND SCHOLTEN, G.
Roos. (**Roses.**)
Jversl. Proefst. Bloem. Aalsmeer, 1959, pp. 92-102.

Trials showed that *R. indica major* is a good rootstock for Baccara. Symptoms of Mn deficiency, which followed the application of Fe-chelate, were not corrected by soil or leaf applications of Mn. Mildew was controlled by 0·25% of W.P.155 (an organophosphorus compound).

1165. LEROY, Y.
Le rosier haute tige en Algérie. (**Standard roses in Algeria.**)
Rev. hort. Algér., 1959, **63**(10/12): 22-5, illus.

The rootstock *R. canina* is unsuitable for Algeria, but standard rose bushes can be obtained with the use of large vigorous *indica major* stools which should be planted at the normal depth in winter. The following spring the resultant stout shoots are thinned to 2–6 per stool spaced well apart, and unwanted side shoots are removed. In the autumn or the following spring the shoots are high-worked. During the 3rd winter the stools are dug up with their grafted shoots, and any ungrafted shoots are removed. The stools are then replanted at 10–20 cm. depth, and the shoots produce root systems along their buried portions. At the beginning of the 4th winter the stools are dug up again and the rooted standards are severed from them.

1166. MCFADDEN, S. E., JR.
Production of tree roses on *Rosa fortuneana* stock.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 413-17, illus.

Unbranched shoots of the current season's growth were cut from established plants of *Rosa fortuneana*, placed in pine-sawdust or a 4:6 mixture of peat and perlite and rooted under constant mist out of doors. The length of the cuttings did not usually exceed 6 ft., these being used to form tall "weeping" trees with climbing varieties. The rooted cuttings were potted in 2 gal. containers in a sterilized mixture of $\frac{1}{3}$ peat and $\frac{2}{3}$ sandy top soil adjusted to pH 5·5 to 6·5. After establishment 2 scion buds were inserted, at the desired height, on opposite sides of the standards to assure symmetrical top growth.—Univ. Fla, Gainesville.

1167. KAMP, J. R., AND SHANNON, J. C.
Production responses of Better Times roses to decreased spacing distances and various nutrient levels.
Ill. St. Flor. Ass. Bull., 1960, No. 205, pp. 1, 3-4, bibl. 2.

Better Times plants, allowed 0·585 sq. ft. each, produced 4 more flowers per sq. ft. when supplied with 80 p.p.m. NO_3 than when supplied with 20 p.p.m. Other nutrient effects on flower production and quality were not of commercial importance.

1168. BOODLEY, J. W., AND SEELEY, J. G.
Some effects of adjusting night temperatures on growth of greenhouse roses.
Progr. Rep. Pa agric. Exp. Stat. **218**, 1960, pp. 8, bibl. 12.

The rose varieties Better Times, Golden Rapture, Peter's Briarcliff and Lily White were grown in the greenhouse for 3 seasons either at a standard night temperature of 60° F. or at a night temperature adjusted to 55° F. following cloudy days with the standard night temperature at other times. Temperature control was maintained from November till April. Reducing the night temperature following cloudy days reduced the flower production and the rate of plant growth without any compensating increase in the keeping quality of the flowers. In the fourth season the night temperature was increased to 65° F. following clear days and was maintained at 60° F. at other times. This treatment did not improve flower production compared with maintaining a standard night temperature of 60° F. all the time. It is concluded that the night temperature should not be adjusted in relation to the light intensity of the previous day.

1169. ZAKON, D. L.
Flooding system saves time, labor in irrigation.
Amer. Nurserym., 1960, **112**(4): 9, 48, illus.

A nurseryman in Massachusetts has reduced the time taken to water 16,000 potted rose plants from 60 to 2 hours by growing them in plastic-lined trenches, which are flooded when the plants need water.

1170. KAZMAIER, H. E.
Some pathophysiological aspects of premature defoliation associated with rose blackspot.
Diss. Abstr., 1960, **21**: 21, being *L.C. Card No. Mic.* 60-2122 of 58 pp.

It was shown that some substance was produced *in vitro* by *Diplocarpon rosae*, which will completely or partially break down IAA. Both IAA and some substances acting as auxin precursors were extracted from 250-mg. samples of healthy leaflets at the beginning of the autumn, but were not recovered from comparable diseased leaflets. Later in the autumn no auxins were recovered from either healthy or diseased leaflets.—Ohio St. Univ.

1171. FISHER, G. (DEEP, I. W.)
Dr. Deep reveals mildew study on roses at Northwest meeting.
Flor. Exch., 1960, **134**(26): 7.

In preliminary field tests an Acti-dione PM spray was most effective for rose mildew control, and dusts of sulphur and Phaltan were least effective. Phaltan was very effective against black spot and rust.—Ore. St. Coll., Corvallis.

1172. NAEGELE, J. A., GLANCEY, B. M., AND ALLER, H.
How is your spraying technique?
Bull. N.Y. St. Flower Grs, 1960, No. 171, p. 3.

By using fluorescent powders in acaricide sprays it has been shown that variability in the control of red spider on roses is due to differences in the coverage achieved by different personnel and equipment.

1173. (TOY, ST. J., AND MAHLSTEDE, J. P.)
Paraffin wax on roses.
Amer. Nurserym., 1960, **112**(4): 98.

Spring-planted roses, which had been waxed, produced about 50% more flowers and shoot growth than did unwaxed bushes [see also *H.A.*, 29:3911]. After cold storage at an R.H. near 100% waxed plants produced more root and shoot growth, less mould infestation, and had a higher moisture content. A wax coating also reduced CO_2 production by about 20%. Shoot tissue did not appear to be affected when it was dipped in wax at 190° F.—Iowa St. Univ., Ames.

1174. STESSEL, G. J.
Prevention of "grey mould" in stored nursery stock.
Flor. Exch., 1960, **134**(23): 15.

Effective control of *Botrytis* sp. was obtained on dormant, bare-root roses stored in polythene bags using captan, 7·5% dust, or Terraclor, 20% dust, but adequate ventilation was necessary, since Terraclor inhibited subsequent plant growth when confined with the plant in the bag [see also *H.A.*, 28: 2923]. A programme of treatments used successfully by a large grower on stored roses is given.—Univ. Rhode Is.

1175. VAN DOESBURG, J.
Het voorkomen van schimmel tijdens het bewaren. **(The occurrence of mould during storage.)**
Jaarb. Proefst. Boomkw. Boskoop, 1959, pp. 100-2, illus.

Rose bushes dusted with B 500 before cold storage showed no mould (*Botrytis cinerea*) infection at 1° C., and almost none at −1° C.

Other trees and shrubs.

(*See also* 25, 38, 65, 89, 274, 311, 1634.)

1176. BOSKOOP (DORSMAN, C.).
Jaarboek Proefstation voor de Boomkwekerij te Boskoop, 1959. **(Yearbook of Boskoop Tree and Shrub Nursery Experiment Station, 1959)**, pp. 133, illus.

In addition to articles abstracted separately the yearbook reports work on: *Propagation:* The handling of winter cuttings of M.VII, M.IX and Brompton rootstocks and of *Philadelphus*, *Weigela* and *Berberis stenophylla*; rooting hormones for conifers; the use of a new grafting wax (Plasterine);

grafting under glass of beech, oak and birch. A report from the Experimental Garden in Noordbroek describes work on rose propagation, control of mildew on *Crataegus* and roses, soil sterilization and weed control, and the use of cacao waste as a fertilizer. *Soil studies:* Root development of ornamental shrubs in relation to soil drainage; the use of peat top dressings. *Pests and diseases:* Trials on the control of *Phytophthora cactorum* on clematis, *Cercospora* leaf spot of rhododendrons, *Diplocarpon* leaf spot of roses, oak mildew and crown gall on apple seedlings; selection of virus-free material of stone fruits and peonies. *Weed control:* The tolerance of several plants to simazine in the soil; simazine for weed control in potted clematis and hydrangeas; post-emergence weed control in seed-beds; control of *Lemna* and *Azolla*. *Breeding and selection:* Of *Aristolochia*, azaleas, berberis, buddleia, clematis, cotoneaster, *Cytisus*, hydrangeas, *Kalmia*, *Pernettya*, *Potentilla* and rhododendrons, Separate articles describe the chemical inhibition of growth in cool-stored plants and the preservation of bamboo canes.

1177. DE LA ROCHE, G.
Les plantations dans les parcs et les jardins. III. Arbustes et conifères. (**Tree planting in parks and gardens. III. Shrubs and conifers.**)
Bull. hort. Liège, 1960, **15**: 260-5.

Species and varieties for cover, hedges, beds, masses, groups, isolated specimens, rockeries, slopes and banks. [For previous parts see *H.A.*, 30: 4248.]

1178. ALTHAUS, R. E.
Use and effect of gibberellins on plant growth.
Proc. 35th nat. Shade Tree Conf., 1959, pp. 170-7, bibl. 13.

Some results with deciduous ornamental trees and shrubs reviewed.

1179. JOHNS, H. R., JR.
Tree growth retardants.
Proc. 35th nat. Shade Tree Conf., 1959, pp. 130-43.

A review of methods and uses, with particular reference to ornamental trees.

1180. REISCH, K. W.
Current analysis of the use of chemicals to prevent fruiting of trees.
Proc. 35th nat. Shade Tree Conf., 1959, pp. 37-44, bibl. 4.

A review, including unpublished work on ginkgo, apple, plum, elm, maple, mulberry and horse-chestnut.

1181. (TINGA, J. H.)
Winter protection for container plants.
Amer. Nurserym., 1960, **111**(6): 44-6.

A group of Schipka laurel cherry and *Ligustrum* plants in containers were protected by straw bales stacked round the sides supporting a snow fence as cover, and on February 1 the plants still possessed 71% of green leaves compared with 18% on plants in the open. The effect of a hard frost on unripened shoots of pyracantha was reduced by covering the plants with polythene.—Va agric. Exp. Stat.

1182. ROW, V. V.
Growth regulants in maple bark and flowers.
Contr. Boyce Thompson Inst., 1960, **20**: 381-3, bibl. 4.

Massive overgrowths found on the main trunks of maples (*Acer platanoides*) were tested for volatile emanations such as ethylene and for other growth regulators. An unsaturated compound was found in the affected tissue and IAA was present in both affected and healthy bark. There was also evidence that 2 additional growth regulators were present in the extracts from the affected bark.

1183. WYMAN, D.
Popular hedges in list of barberries not banned by quarantine.
Amer. Nurserym., 1960, **112**(7): 10-11, 107-10, illus.

Twenty-eight ornamental *Berberis* species resistant to black stem rust of wheat are described.

1184. DE SOUZA, H. M., AND INFORZATO, R.
Enraizamento de estacas de *Camellia japonica* L. var. *alba plena* por meio de hormônios vegetais. (**Rooting cuttings of *Camellia japonica* var. *alba plena* with growth substances.**) [English summary 8 lines.]
Bragantia, 1959, **18**: XXXIX-XLI, illus.

In a trial with 10-cm. semi-hardwood cuttings the best results after 8 months in sand in a cold frame were obtained with 100 mg. IBA per 100 l. distilled water and with Vigortone powder, which gave 85 and 60% successful rooting, respectively, compared with 50% in the controls. Both root and shoot growth were also better in the treated cuttings.

1185. KUITERT, L. C.
Effectiveness of a new insecticide for scale insect control.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 395-8, bibl. 4.

Results are given of tea scale (*Fiorinea theae*) control on camellias by 5 insecticides. Dimethoate at 8 and 16 oz. active ingredient per 100 gal. gave outstanding control of adult females as well as all immature forms, and it also appears to have excellent ovicidal properties. In limited trials Dimethoate also controlled the camellia scale (*Lepidosaphes camelliae*) on camellias.—Fla agric. Exp. Stat., Gainesville.

1186. STRUCHTEMEYER, R. A., AND BISSELL, L. P.
Nitrogen fertilization of Christmas trees in Maine.
Me Fm Res., 1960, **8**(1): 20-2, illus.

Urea was applied to fir trees via the leaves or the roots at rates of 0·1 lb. and 0·5 lb. N per tree. Spraying produced leaf damage, which varied from discolouration to complete defoliation. When cut for market, the darkest green trees were those which had received 0·5 lb. N in June.

1187. BELL, L. E.
Shearing and shaping Christmas trees.
Ext. Bull. Mich. St. Univ. **359**, revised 1960, pp. 14, illus.

The purposes of shearing are to control height, width and taper, to stimulate bud development and to remove multiple leaders and branch deformities. Detailed instructions are given on when and how to shear pines, spruces and firs.

1188. VAN DER LAAR, H. J.
Chemische onkruidbestrijding in eenjarige vaststaande koniferen (zaaibedden). (**Chemical weed control in one-year-old conifers in the seed-bed.**)
Chemische onkruidbestrijding in eenjarige verplante koniferen. (**Chemical weed control in one-year-old transplanted conifers.**)
Jaarb. Proefst. Boomkw. Boskoop, 1959, pp. 88-9 and 90-1.

Simazine at 1–1·5 kg./ha. may be used in conifer seed-beds without injury. Weed seedlings were controlled by Shell W (800 l./ha.) plus simazine (1–1·5 kg./ha.). Simazine could be used at 2 kg./ha. on transplanted conifers. No damage was observed when Shell W was applied in the autumn, with or without simazine.

1189. VAN DIJK, P. J. S.
Bestrijding van wolluis in *Pinus*. (**The control of woolly aphis on *Pinus*.**)
Jaarb. Proefst. Boomkw. Boskoop, 1959, pp. 72-5, illus.

Winter oils, summer oil and parathion applied in summer were not effective for the control of this aphid [*Gilletteella cooleyi*] on ornamental pines. Satisfactory control was obtained with yellow oil (6% mineral oil + 0·3% DNOC) applied in the first half of March. However, spraying at this time may cause injury, and therefore one application of 0·2% thiodan during the growing season is preferred.

1190. VAN DIJK, P. J. S.
Bestrijding van rondknop in *Taxus*. (**The control of *Phytoptus psilaspis* in *Taxus*.**)
Jaarb. Proefst. Boomkw. Boskoop, 1959, pp. 70-2, illus.

Good control of mite infestations was obtained by spraying 3 or 4 times with 0·2% endrin between mid-April and the end of June.

1191. COLLINS, R. P.
Graft failures of *Cornus florida*.
Amer. Nurserym., 1960, **112**(4): 12, 44.

Graft failures in this species followed infection with black mould fungus, *Chalaropsis thielavioides* [see also *H.A.*, 29: 1750]. Control measures should be based on sanitation and the use of healthy, vigorous stocks and scions.—Univ. Conn., Storrs.

1192. STAHN, B.
Versuche zur Schaffung eines Einheitssubstrates für *Erica gracilis*. (**Experiments on the production of a standard medium for *Erica gracilis*.**)
Dtsch. Gartenb., 1960, **7**: 136-8, illus.

Coarse peat from Harturannsdorf/Zwickan (so-called azalea peat) was found most suitable for *Erica gracilis*. An optimum nutritional effect was obtained from 10 applications of a 4:2:2 NPK fertilizer supplied at a concentration of 1·4:0·8: 0·25 g. per litre of water. The experiments on a standard medium are still in progress.—VEG-Leitbetr. Moorbeetkult. Markkleeberg.

1193. MARCHAL, J.
Forsythia. [In Dutch.]
Jversl. Proefst. Bloem. Aalsmeer, 1959, pp. 60-1.

The storage of forsythia branches in a fruit cold store was not satisfactory, and, although flower quality was improved by packing the branches in plastic, it was still inferior to that obtained following normal storage at –2° C. Simazine and CMU were the most satisfactory herbicides for use with forsythia.

1194. CANNON, T. F., CHADWICK, L. C., AND REISCH, K. W.
Nitrogen and potassium nutritional studies of *Gleditsia triacanthos inermis* "Moraine".
Proc. Amer. Soc. hort. Sci., 1960, **75**: 693-9, bibl. 9.

See *H.A.*, 29: 2802.

1195. SOUSTER, J.
Variegation in holly.
J. roy. hort. Soc., 1960, **85**: 273-5, bibl. 5.

The cultivars with green-margined leaves with few exceptions sport wholly green shoots, which having more chlorophyll than variegated shoots may crowd them out in time. On the other hand, types with marginal variegation sport wholly white or yellow shoots, which lacking chlorophyll can never dominate the tree. The reasons for frequent sporting in the direction of the marginal colour are discussed.—Roy. bot. Gdns, Kew.

1196. WEISER, C. J., AND BLANEY, L. T.
The effects of boron on the rooting of English holly cuttings.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 704-10, bibl. 9, illus.
(WEISER, C. J.)
Rooting holly cuttings.
Flor. Exch., 1960, **135**(1): 23.

Semi-hardwood terminal cuttings of English holly, taken in autumn and early winter, were treated by soaking the base of the cuttings for 12 hr. in aqueous solutions of IBA and boric acid, singly or in combination. The cuttings were then rooted under mist. The use of B in combination with IBA increased the percentage of rooting, the number and length of roots produced and the speed of rooting. B alone had no effect on rooting but appeared to have a synergistic interaction with IBA, increasing both root initiation and root growth. Considerable variation existed in the concentration of boric acid that gave maximum stimulation of rooting to cuttings from the same clone at different times.—Ore. St. Coll., Corvallis.

1197. Pepin, H. S., and Orchard, W. R.
Control of green algae on English holly.
Canad. Plant Dis. Survey, 1960, **40**(1): 15-17, bibl. 2.

Green algae seriously mar the appearance of the foliage of English holly in British Columbia and the Pacific Northwest. Six fungicides were tested for algaecidal properties. Nabam plus zinc sulphate spray gave the most effective control. [Authors' abstract.]—Exp. Fm, Saanichton, B.C.

1198. Wyman, D.
Shrub honeysuckles with pink to red flowers.
Arnoldia, 1960, **20**: 29-32, illus.

Brief descriptions of bush *Lonicera* species, hybrids and varieties, listed in order of deepening colour.

1199. Marchal, J.
Hortensia. (**Hydrangea.**)
Jversl. Proefst. Bloem. Aalsmeer, 1959, pp. 64-5.

Supplementary superphosphate in the potting compost produced better growth than a lime supplement; however, chlorosis was induced at the highest level of superphosphate. Growth of hydrangeas was good in a mixture of "old lilac soil" (pH 7·4) and peat or turf.

1200. Ibrahim, R. K., and Towers, G. H. N.
Studies of hydrangenol in *Hydrangea macrophylla* Ser. I. Isolation, identification and biosynthesis from C^{14}-labelled compounds.
Canad. J. Biochem. Physiol., 1960, **38**: 627-34, bibl. 16.

Found in flowers, leaves and roots.

1201. Krüssmann, G.
Vorarbeiten für eine Flieder-Sichtung. (**A preliminary survey of lilac varieties.**)
Dtsch. Baumsch., 1960, **12**: 89-108, bibl. 11, illus.

Notes on numerous varieties [see also *H.A.*, 30:5932].

1202. Caron, J. E. A.
Proeven met seringe-onderstammen. (**Trials with lilac rootstocks.**)
Jaarb. Proefst. Boomkw. Boskoop, 1959, pp. 45-7.

Trials of *Syringa* species as rootstocks for 2 lilac varieties showed none to be an improvement on *S. vulgaris*. The percentage of unions was low with *S. japonica*. Suckering of all species varied from year to year.

1203. Sussex, I. M., and others.
Extraction and biological properties of an antifungal fraction of woody plant tissues.
Bot. Gaz., 1960, **121**: 171-5, bibl. 14, illus.

From lilac phloem; the extract also inhibited seed germination and root growth of cucumbers.

1204. Salimei, F. S.
Le magnolie. (**Magnolias.**)
Ital. agric., 1960, **97**: 829-33, illus.

Descriptions of evergreen and deciduous species and varieties, with brief notes on soil requirements and propagation.

1205. Larson, R. A., and Langhans, R. W.
Triple the productivity of poinsettia stock plants.
Bull. N.Y. St. Flower Grs, 1960, No. 171, pp. 4, 6, illus., and *Flor. Exch.*, 1960, **134**(24): 14.

The number of cuttings obtained from stock plants of the variety Barbara Ecke Supreme was increased from about 50 to 150 by using large, well drained containers filled with equal parts of soil, sand and peat, which were watered frequently, and by allowing at least 6 sq. ft. of space per plant. The stock plants were grown at high temperatures (above 65° F.) and were fertilized twice a week, alternately applying potassium nitrate and a 14:28:14 mixture (2½ lb./100 gal.). The cuttings were propagated under a mist system in a well drained propagating medium or directly in pots with a bottom heat of 70° F. and an air temperature of 65° F. After 10 days the cuttings received a complete fertilizer (1¼ lb./100 gal.), and this was repeated every 3 days.

1206. Larson, R. A., and Langhans, R. W.
High quality poinsettia plants the goal for 1960.
Bull. N.Y. St. Flower Grs, 1960, No. 175, pp. 1-3, illus.

Propagation of poinsettias from 2-in. cuttings produced shorter plants for December sale, without any decrease in bract size. The rooting percentage of 2-in. cuttings was only slightly less than that of 4- or 6-in. cuttings. It was possible to pot poinsettias as late as December 15, and greater uniformity was obtained with November-December potting than with late September potting. Cuttings taken after September 20 need extra lighting.

1207. Langhans, R. W., and Larson, R. A.
The influence of day and night temperatures on the flowering of poinsettia (*Euphorbia pulcherrima*).
Proc. Amer. Soc. hort. Sci., 1960, **75**: 748-52, bibl. 6.

Combinations of 4 day and night temperatures (50°, 60°, 70° and 80° F.) and 2 day lengths (natural and 9-hr.) were compared in 1957. In 1958 a temperature of 65° F. was compared with 60° and 70°. The warmer the day temperature with any one night temperature, or the warmer the night temperature up to 70°, the earlier the plants flowered. Plants grown at a night temperature of 80° did not flower at the natural day length, and at the 9-hr. day length they flowered later than when grown at 70°. Plants grown at 65° night temperature and a natural day length were comparable to plants grown at a 70° night temperature. Those grown at a 65° night temperature and a 9-hr. day length flowered earlier at a 70° day temperature than at a 60° or 65° day temperature. In most cases, with each increase in day temperature, the number of days to flowering decreased. [See also *H.A.*, 29: 766, and 30: 1095.]—Cornell Univ.

1208. Langhans, R. W., and Miller, R. O.
Influence of daylength, temperature and number of short days on the flowering of poinsettia (*Euphorbia pulcherrima*).
Proc. Amer. Soc. hort. Sci., 1960, **75**: 753-60, bibl. 8.

In this study only constant temperatures were used. It was found that as the temperature provided was increased from 60° F. to 80° F., shorter day lengths were necessary for flowering and the number of short days required increased. Of the 3 varieties studied Ecke's White and Pink were less tolerant of low temperatures than Barbara Ecke Supreme. The critical day length proved very difficult to define. It varied with variety, temperature and stage of flower development.—Cornell Univ.

1209. Struckmeyer, B. E., and Beck, G. E.
Flower bud initiation and development in poinsettia (*Euphorbia pulcherrima* Willd.).
Proc. Amer. Soc. hort. Sci., 1960, **75**: 730-8, bibl. 7, illus.

Poinsettia plants (var. Ruth Ecke) were given 5 to 60 short days. Stem tips were examined at 5-day intervals to determine the rate of floral initiation and "flower" development. The first microscopic evidence of floral initiation in the apical meristem appeared after plants had received 15 short days. However, only 8 short days or less were necessary to induce the formation of a rudimentary primary cyathium, which was not microscopically evident until several days later. The shoots from the axils of the 3 leaves which subtend the rudimentary primary cyathium remained vegetative with a short-day treatment of 8 days or less, rather than differentiating into the 3 first-order branches of a normal "flower". There was a direct relationship between the flowering intensity (as measured by the number of cyathia and bracts) and the number of short days the plant received. At least 60 short days were necessary for the fourth-order cyathia to be microscopically apparent. [Authors' summary.]—Univ. Wis., Madison.

1210. Struckmeyer, B. E.
The effect of inadequate supplies of some nutrient elements on foliar symptoms and leaf anatomy of poinsettia (*Euphorbia pulcherrima* Willd.).
Proc. Amer. Soc. hort. Sci., 1960, **75**: 739-47, bibl. 12, illus.

Identification of a particular mineral deficiency in poinsettia plants from external symptoms only is sometimes difficult, particularly in the early stages. It was found that the abnormal anatomy of a leaf resulting from inadequate supplies of certain elements may assist in identifying the deficient element. Necrotic lesions, hypertrophy and hyperplasia, chloroplast disintegration, accumulation of cellular inclusions and starch accumulations were all characteristics which accompanied some mineral deficiencies. For example, leaves deficient in Ca, K, Zn and B all exhibited hypertrophy and hyperplasia, but each deficiency was also associated with other abnormal characteristics which distinguished them from one another.—Univ. Wis., Madison.

1211. McFadden, L. A.
Bacterial blight of poinsettia.
Creager, D. B.
Inoculation studies with *Corynebacterium poinsettiae*.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 392-4, bibl. 5, illus., and 417-21, bibl. 6, illus.

The first paper describes preliminary trials, in which weekly applications of Agri-mycin 500 at 4 lb. per 100 gal. gave complete control of a bacterial blight on poinsettias, identified in the second paper as being caused by *Corynebacterium poinsettiae*. Good reduction in disease incidence was also obtained with Agri-mycin 500 at 2 and 3 lb. per 100 gal., Agri-Strep at 60 p.p.m., tribasic copper sulphate at 4 lb. per 100 gal. and Agri-mycin 100 at 600 p.p.m. Dusting cuttings with, or soaking them in, Agri-Strep appeared promising for preventing the spread of the disease.—Subtrop. Exp. Stat., Homestead.

1212. Scholz, J.
Výsledky vzdálené hybridisace, provedené za účelem zvýšení mrazuvzdornosti u rododendronů. (**Results of distant hybridization, carried out for the purpose of increasing frost resistance in rhododendrons.**) [Russian and German summaries ⅓ p. each.]
Acta Univ. Agric., Brno, Ser. A, 1959, Special No., pp. 29-37, bibl. 4, illus.

Hybrids of *Rhododendron smirnowii* × *R. hybridum* developed in Průhonice in 1943 and 1944 have large flowers, 5–9 cm. in diameter, and have proved able to withstand −30·5° C.

1213. SCHNEIDER, E. F., AND SNYDER, W. E.
Effects of urea sprays on growth and flowering of azaleas.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 658-62, bibl. 6.

In tests with 3 azalea cultivars it was shown that N applied in urea sprays was absorbed by the leaves, the increase in the N content of both young and mature leaves being highly significant. A concentration of 10 lb. urea per 100 gal. could be safely applied if 2·5 lb. hydrated lime were included in the spray solution. N was supplied much more effectively by foliar sprays of urea plus one soil application of commercial fertilizer than by soil applications alone. Foliar sprays of urea had no effect on the total number of flower buds, the number of multiple flower buds, the total number of shoots that were initiated or the winter hardiness of the plants.—Rutgers St. Univ., New Brunswick, N.J.

1214. EDSON, S. N., AND WATKINS, J. V.
The Comber soil acidity test for soluble iron in azalea soils.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 380-3, bibl. 11.

The procedure for soil sampling and testing is described and colour reactions indicating iron availability are given. Only very small amounts of available iron were needed to prevent chlorosis developing in Formosa azalea plants.—Univ. Fla, Gainesville.

1215. CREECH, J. L., AND HAWLEY, W.
Effects of mulching on growth and winter injury of evergreen azaleas.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 650-7, bibl. 4, illus.

The growth of evergreen azaleas in the nursery was greatly improved by a 4-inch hay mulch from May until 20 September, but retention of the mulch until the date of the first frost or continuously throughout the winter resulted in severe frost damage. Non-mulched plants made the least growth and suffered the least amount of winter injury. Summer mulching conserved soil moisture well. Air temperatures recorded 2 in. above the mulch during October and November averaged 5·5° F. lower than those above non-mulched plots. Winter injury to the plants on the continuously mulched plots was attributed to the combined effects of high soil moisture late in the season and low air temperatures during the critical period of first frost.—U.S.D.A., Beltsville, Md, and Plant Introd. Stat., Savannah, Ga.

1216. BIVINS, J. L., AND HARVEY, W. A.
Chemical weed control in azalea seed crop.
Calif. Agric., 1960, **14**(8): 14.

Neburon at 4 and 8 lb. a.i. per acre gave good weed control throughout the season without damage to the azaleas. CDED liquid and granular formulations at 8 and 16 lb. a.i. per acre gave good weed control for 4 months, but some varieties were damaged by the liquid formulation.

1217. MUNNECKE, D. E., CHANDLER, P. A., AND BIVINS, J. L.
Investigations show azalea root rot can be controlled by soil treatment.
Calif. Agric., 1960, **14**(9): 9-10.

Methyl bromide, Vapam and Telone were tested over a 2-year period. Only methyl bromide at 1 or 2 lb. per 100 sq. ft. was followed by significant improvements in growth as compared with untreated plots.—Univ. Calif., Los Angeles.

SUB-TROPICAL FRUIT AND PLANTATION CROPS.

General.

1218. COMELLI, A.
Les cultures fruitières subtropicales en Israël. 1. Le milieu. 2. Les agrumes en Israël. 3. Le bananier en Israël. 4. Le palmier dattier en Israël. 5. L'avocatier en Israël. 6. Fruits d'importance secondaire. (**Subtropical fruit crops in Israel. 1. The locality. 2. Citrus. 3. The banana. 4. The date palm. 5. The avocado pear. 6. Fruits of secondary importance.**) [English, German, Spanish and Russian summaries.]
Fruits d'Outre Mer, 1960, **15**: 52-68, 129-38, 173-84, 223-31, 261-74, 317-23, bibl. 44, all parts illus.

Part 1 covers topographical regions, climate, water supply and irrigation, soils and horticultural research. Part 2 deals with citrus export statistics, varieties (mainly Jaffa or Shamouti but also Valencia Late and Washington Navel oranges, grapefruit, lemon, clementine, mandarin), rootstocks (generally field grafting; sour orange and sweet lime), cultural practices (spacing, windbreaks, irrigation, nonculture plus oil sprays for weed control), control of diseases and pests, harvesting, packing and marketing. Part 3 provides a succinct account of the cultivation of the dwarf banana in Israel and the measures taken to protect it against wind, cold and salt in irrigation water, as also against eelworms and scales. Part 4, devoted to date palms, provides information on pollination studies, multiplication by suckers and the process of accustoming the young plant to saline water. Physiological studies are carried out at the Agricultural School of Beit Yerach. In Part 5, which deals with avocadoes, the subjects discussed include climate and soil, area and localities, rootstocks (Mexicola, Duke and Janter of the Mexican race when there is no danger of salinity and rootstocks of the West Indian race in saline conditions), varieties (Fuerte, Nabal, Ettinger, Benik, Anaheim and Hass; those under trial include Dickinson, Queen, Lula, Taft, and seedlings of Dutton, Fuerte and Benik), spacing (6 × 6 or 8 × 6 m., thinned to 6 × 12 and 8 × 12), windbreaks, irrigation, soil management (in young plantations clean weeding by harrowing and herbicidal spraying or inter-cropping with bananas plus herbicidal spraying, in more adult plantations grass in winter but herbicidal spraying in summer, little maintenance after 10 years old), fertilization (farmyard manure or compost plus inorganic N), layout (with reference to pollination), diseases, pests, harvesting, packing, price and tonnage. Finally the last part deals briefly with mangoes, pecans, guavas, loquats and few other minor fruits.

1219. ABDULLAEV, A. G.
Geographical trials of subtropical crops in Azerbajdžan. [Russian, with English summary ½ p.)
Subtrop. Kul'tury, 1959, No. 2, pp. 70-3.

The most suitable locations for growing pomegranates, olives, bay laurel and tea.

1220. WOLFENBARGER, D. O.
Principles applicable for spraying subtropical fruit plants.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 305-7, bibl. 9.

Objectives of, and materials for, fungicidal, insecticidal and nutritional sprays.

1221. HOPE, T.
What the fruit grower should know about quality and maturity.
Qd agric. J., 1960, **86**: 315-18, 374-7.

Maturity standards and appearances of temperate and tropical fruits when ready for harvest, especially pineapples, citrus, grapes, avocadoes and mangoes.

Avocadoes.

(*See also* 1218, 1367.)

1222. RUEHLE, G. D.
The Florida avocado industry.
Bull. Fla agric. Exp. Stats. **602**, 1958, pp. 100, bibl. 71, illus.

Including sections on varieties, cold hardiness, pollination, propagation, culture, marketing and plant protection.

1223. SRIRAM, T. A., AND RAO, I. K. S.
A note on the occurrence of vivipary in the avocado.
South Indian Hort., 1958, **6**: 83-4, bibl. 14, illus.

In the variety Pollock at the Kallar Fruit Research Station.

1224. OPPENHEIMER, C., RADZISZEWSKA, F., AND KADMAN, A.
Normal nutrition and nutrition disturbance of the avocado tree.
Spec. Bull. Beit Dagan agric. Res. Stat., **28**, 1960, pp. 35, bibl. 6.

The work summarized in this report was carried out in Israel from 1958 to 1960. Initially foliar analyses were made for N, K, Ca and Mg on 5 occasions, P and Fe on 3 and Zn and Cu once only on healthy Fuerte and Nabal trees. Other varieties investigated were Ettinger, Benik, Degania and some salt-resistant West Indian seedlings. Varietal differences were found for P, K, Fe and Mg. The highest values for N occurred in the autumn, and young leaves contained more than mature ones. Chlorotic leaves were lower in N and higher in K and other cations. High values of Mg and Zn appeared to be associated with resistance to salinity and lime. No significant correlations could be established between the yield and N content of the leaves, but significantly higher values for N were found in trees budded on 2 Mexican rootstocks than in trees on 2 Guatemalan rootstocks.

1225. BRUSCA, J. N., AND HAAS, A. R. C.
Magnesium required by avocado trees but excessive amounts may be toxic.
Calif. Agric., 1960, **14**(7): 5-6, illus.

Seedlings grown in sand culture were supplied with a complete nutrient solution, in which the nitrate at 986 p.p.m. was composed of a mixture of Ca and Mg nitrates in various proportions. The best growth was made when Ca was absent or in the lowest concentration and when Mg was at its highest. In another experiment, however, in which increasing concentrations of Mg sulphate were supplied, the leaves showed toxicity symptoms at a level of 216 p.p.m. Mg in the presence of 159 p.p.m. Ca, but these symptoms were reduced when the Ca was in better balance. Healthy root growth was also shown to depend on adequate Mg in the nutrient solution.

1226. HARKNESS, R. W.
Boron deficiency and alternate bearing in avocados.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 311-17.

Alternate bearing was much more pronounced on late-picked Booth 8 trees than on early-picked trees. Fruit drop was heavier from low yielding than from high yielding trees, but the size and appearance of the trees were not related to drop. Tests have shown that brown necrotic areas on the seeds caused by B deficiency can be eliminated by raising the B content of the leaves to 50 p.p.m. and maintaining it at that level by applying ½ to 1 lb. of borax per tree per annum. Ca and Mg contents increased with the age of the leaf, K, P and N decreased, but differences in B content could not be explained by the age of the leaves. Considerable evidence was obtained, however, which suggests that yield and alternate bearing are influenced by the B content.—Subtrop. Exp. Stat., Homestead.

1227. Wolfenbarger, D. O.
Insect pests of the avocado and their control.
Bull. Fla agric. Exp. Stats **605**, 1958, pp. 51, illus.

1228. Hatton, T. T., Jr., and Campbell, C. W.
Evaluation of indices for Florida avocado maturity.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 349-53, bibl. 7.

Specific gravity of the whole fruit, number of days required for the fruit to soften, loss in fruit weight during softening, corking of lenticels and seed-coat colour were found to have some value as general maturity indices. Flesh colour did not change and has no value as a maturity index. The results indicate that the indices at present used for maturity regulations, i.e. minimum fruit weights and diameters and earliest picking dates for each variety, are still the most satisfactory.—U.S.D.A., Miami.

1229. Campbell, C. W., and Hatton, T. T., Jr.
Chilling injury in Pollock avocados during cold storage.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 337-8, bibl. 4.

Mature Pollock avocadoes were stored at 35, 40, 45 and 50° F. for 6 to 22 days during 2 seasons. Chilling injury occurred in fruits stored at each of these temperatures for 19 to 22 days. The severity of the injuries under comparable conditions differed between the 2 seasons, thereby indicating that preharvest factors may be important in the reaction of avocadoes to low temperature.—U.S.D.A., Miami.

1230. K[ay], D. E.
The United Kingdom market for avocado pears.
Trop. Sci., 1960, **2**: 103-5.

Varieties (mostly Fuerte), type of fruit required, packing (including details of S. African packing and grading regulations) and cold storage.

Citrus—breeding, varieties, propagation and rootstocks.

(*See also* 1258.)

1231. Kolelišvili, M. V.
Results of studies on the basic material used in the breeding of lemons. [Russian, with English summary ½ p.]
Subtrop. Kul'tury, 1959, No. 3, pp. 53-63, illus.

At Suhumi 50 lemon seedlings, which withstood −7 to −8·5° C. without injury, formed the material from which frost-resistant strains are to be developed.

1232. Majsuradze, N. I.
The inheritance of characters and properties in the inter-specific hybridization of grapefruit and pomelo. [Russian, with English summary ¼ p.]
Subtrop. Kul'tury, 1959, No. 4, pp. 49-57, illus.

Hybrids of grapefruit and pomelo with *Poncirus trifoliata*, Unshiu and Šiva-mikan mandarins, orange and clementine have been obtained for the purpose of increasing frost resistance and earliness. Of the F_1 hybrids the most valuable were those of grapefruit × Azahikan pomelo and pomelo × Unshiu mandarin.

1233. Tatarišvili, A. N.
Fruiting citrus hybrids bred in the Batumi botanical gardens. [Russian, with English summary 9 lines.]
Subtrop. Kul'tury, 1959, No. 1, pp. 49-54, bibl. 6, illus.

Details are given of hybrids produced by crossing Unshiu mandarins with oranges. They are characterized by frost resistance, early ripening, good flavour and good keeping quality.

1234. Majsuradze, N. I.
The orange collection of the Suhumi Experiment Station. [Russian.]
Subtrop. Kul'tury, 1959, No. 3, pp. 36-45, illus.

This collection, started in 1926, comprises 184 specimens, of which 75 were obtained from abroad. A general description is given of the 5 main groups, and frost resistance, earliness and quality are discussed.

1235. Yamaguchi, S., and Yakushiji, K.
Investigation on the bud variation of the citrus tree. [Japanese, with English summary ½ p.]
Bull. Ehime Fruit Tree Exp. Stat., 1960, No. 1, pp. 53-66, bibl. 5, illus.

Superior strains of Satsuma and Navel oranges described.

1236. Spina, P.
Nuove cultivar di arancio da mutazioni gemmarie. **(New orange varieties obtained from bud mutations.)**
Tecn. agric., 1959, **11**: 493-508, bibl. 30, illus.

Descriptions of 9 new Sicilian varieties.

1237. Čhaidze, G. D.
***Citrus ichangensis* as a component for obtaining frost resistant vegetative hybrids of lemon.** [Russian, with English summary ⅓ p.]
Subtrop. Kul'tury, 1959, No. 3, pp. 64-8, bibl. 9, illus.

Among the 72 plants obtained by grafting 4-month-old lemon seedlings on cuttings from mature plants of *Citrus ichangensis* 13 were found to have leaves very similar to those of *C. ichangensis*. It is assumed that these vegetative hybrids will possess the greater frost resistance of *C. ichangensis*.

1238. Montenegro, H. W. S., and Salibe, A. A.
Conservação de sementes de porta-enxertos para citrus. **(Storage of seeds of citrus rootstocks.)**
Rev. Agric. Piracicaba, 1960, **35**: 109-35, bibl. 4.

Seeds of the exocortis-resistant varieties Caipira orange, sour orange, trifoliate orange, rough lemon, Rangpur lime, Persian lime, Troyer citrange and Cleopatra mandarin were washed free of mucilage, dried and stored within 48 hours of harvesting. The alternatives in storage treatment were:—(a) fungicidal treatment or none, (b) open receptacles or sealed plastic bags, and (c) room temperature or 8° C. The moisture content and germinating capacity were recorded at intervals. After 224 days the germinating capacity was still highly satisfactory in the seeds stored in plastic bags at either temperature. Fungicidal treatment was a great advantage, and in the untreated seeds fungal infection was closely correlated with moisture content. Germination was seriously checked at low moisture contents, the critical minima being about 27% for trifoliate orange and 10% for the other types. In seeds exposed to the atmosphere the values fell somewhat below these figures.—Univ. S. Paulo, Piracicaba.

1239. Lomija, N. Ja.
The effect of pre-sowing low temperature treatment of seeds of lemon hybrids on germination. [Russian.]
Subtrop. Kul'tury, 1959, No. 2, pp. 37-9, illus.

Cold treatment of swelling seeds of 2 lemon hybrids for 16 days improved the germination percentage, better results being obtained at −1 to −2° C. than at −3 to −4° C.

1240. Muramatsu, H., and Maruki, T.
Studies on the rootstock of the citrus tree. (Part I.) [Japanese, with English summary 2 pp.]
Bull. Ehime Fruit Tree Exp. Stat., 1960, No. 1, pp. 43-52, bibl. 14.

Results of 16 years' observations on Early Satsuma orange, Satsuma orange and Summer orange grafted onto a number of different rootstocks are summarized. Characteristics recorded include tree vigour, yield, growth reactions at the bud union, irregular bearing and fruit quality.

1241. Halsey, D. D.
Rootstock recommendations for Coachella valley.
Calif. Citrogr., 1960, **45**: 223-5.
Rootstocks for Coachella.
West. Fruit Gr, 1960, **14**(5): 37-8.

Citrus rootstocks listed and described.

1242. Ford, H. W., Feder, W. A., and Hutchins, P. C.
Promising rootstocks that tolerate the burrowing nematode.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 96-102, bibl. 5.

Tolerance to *Radopholus similis* was shown by Sanguine grosse ronde sweet orange (P. I. 105014), Pineapple orange (RS-156) and Carrizo citrange (C.P.B. 45109B), in addition to rough lemon A and B and Clone X which were reported tolerant earlier [see *H.A.*, 27: 2803].—Fla Citrus Exp. Stat., Lake Alfred, and U.S.D.A., Orlando, Fla.

1243. Singh, S.
Nasnaran is the rootstock for citrus.
Indian Hort., 1960, **4**(2): 21, 32, illus.

The results of trials of nasnaran, introduced from Peradeniya, as a stock for Sangtra mandarin and Malta sweet orange are discussed. In tree vigour the trees on nasnaran stocks were superior to those on other stocks. In yield Malta on nasnaran took first place, but Sangtra on nasnaran was second to Sangtra on citron. In both varieties the peel was thinner, and the soluble solids and acidity higher, on nasnaran stock.

1244. Russo, F.
Ulteriore contributo di esperienze sul comportamento del *Citrus volkameriana* Pasq. quale portinnesto de limone. **(A further contribution to experience of the performance of *Citrus volkameriana* as a rootstock for lemon.)**
Tecn. agric., 1959, **11**: 423-7, bibl. 1.

Further experiments have shown that the 3 clones of *C. volkameriana* called Catania, Acireale and Napoli are resistant to mal secco (*Deuterophoma tracheiphila*) and *Phytophthora* spp. In 6 years' experiments the species have not shown incompatibility with any of the lemon varieties tested. Five to six years after planting out, Femminello and Monachello lemons on *C. volkameriana* were superior to the same varieties on sour orange by 40 and 25%, respectively, in tree growth and by 500 and 25%, respectively, in yield. [For earlier work, see *H.A.*, 27: 752.]—Staz. sper. Agrumic., Acireale.

1245. Gardner, F. E., and Horanic, G. E.
Relation of citrus nursery tree size from $\frac{1}{2}$ to $\frac{7}{8}$ inches to ultimate size and production.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 102-5, bibl. 3.

Although tree size and yield were profoundly influenced by the rootstock variety, statistical studies of the data available indicate no pronounced correlation between the initial sizes recorded and ultimate size or between initial size and yield within the various rootstocks. [From authors' summary.]—U.S.D.A., Orlando, Fla.

1246. LINCOLN, F. B.
The juice content of Tahiti limes produced on various rootstocks.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 361-2, bibl. 1.

The juice content of the limes grown on 5 different rootstocks showed very little variation.

Citrus—climatic and other environmental factors.

1247. IWASAKI, T., AND OWADA, A.
Studies on the control of alternate bearing in citrus. II. The effect of environmental conditions during winter on the number of flowers and the growth of shoots. [Japanese, with English summary $\frac{1}{3}$ p.]
J. hort. Ass. Japan, 1960, **29**: 37-46, bibl. 11, illus.

Observations over 14 years are summarized. Drought from December to the end of January increased the number of flowers in spring, but drought later in the winter reduced the number of flowers. Higher winter temperatures resulted in increased flowering in spring, the temperatures between December and March being decisive for lemon, and those between December and the end of January for Satsuma orange, though to a lesser extent. Higher temperatures also usually promoted shoot growth, except where the increase in the number of flowers was very considerable. Covering the trees with straw mats gave protection from cold winds, but the reduced sunlight transmitted reduced the number of flowers and shoots, except in very severe winters when the protection afforded more than compensated for the loss of light. [For Part I, see *H.A.*, 30: 5994.]

1248. FREEBAIRN, H. T.
Changes in amounts of organic acids in citrus leaves during periods of cold storage.
Nature, 1960, **188**: 243-4, bibl. 6.

Three-month-old Lisbon lemon plants were cold stored at 1° and 10° C. and also stored normally at 20°, all in darkened chambers. Leaf analysis subsequently showed that cold storage increased the malic acid content by as much as 140% and reduced the citric acid by as much as 35%. The 10° treatment showed greater differences than the 1° compared with the 20° treatment. Total free acids were similar under all treatments.—Univ. Calif., Riverside.

1249. KAPANADZE, I. E.
The relationship between pollen grain development and frost resistance in lemon. [Russian, with English summary $\frac{1}{4}$ p.]
Subtrop. Kul'tury, 1959, No. 1, pp. 57-61, illus.

The production of abortive pollen at low temperatures is attributed to the destruction of the pollen mother cells, and hence greater frost resistance results in the production of larger amounts of normal pollen. Of the varieties tested *Citrus ichangensis* and the Meyer lemon were found to be the most frost resistant during sporogenesis.

1250. GOČOLAŠVILI, M. M., ZALDASTANIŠVILI, Š. G., AND DEMETRADZE, T. JA.
Frost resistance and winter hardiness of subtropical tree crops. [Russian, with English summary $\frac{1}{2}$ p.]
Subtrop. Kul'tury, 1959, No. 1, pp. 3-12, bibl. 26.

Lemon and associated hybrids were the least resistant of the citrus collection, the oranges had more resistance, but the hardiest were the Unshiu mandarins, particularly the varieties Silver Hill and Cavano-Vasse. Pomelo showed great varietal variability in frost resistance. The hardiness of citrus trees could be increased by the use of FYM or other organic manures. Assam varieties of tea were the most sensitive to frost injury, the Chinese types showing considerable resistance.

1251. GLAZYRIN, V. A.
The effect of freezing winds on mandarin yields. [Russian, with English summary 9 lines.]
Subtrop. Kul'tury, 1959, No. 1, pp. 55-6.

Unshiu mandarin trees protected by windbreaks cropped well, but unprotected trees bore little or no fruit.

1252. GEORG, J. G.
The use of wind machines for frost protection of Florida citrus—1959-60.
Citrus. Ind. 1960, **41**(8): 9-11.

Results obtained with 25 h.p. electric and 60 h.p. petrol machines are discussed. In general, the protection obtained downwind from the machines was greater than that in all other directions. [See also *H.A.*, 29: 1803.]

1253. QUICK, A.
Frost machines effective at Tocumwal.
Citrus News, 1960, **36**: 61.

The construction and costs of wind machines.

1254. TURRELL, F. M., AND AUSTIN, S. W.
Recovery from freeze injury by citrus.
Calif. Agric., 1960, **14**(7): 9-10.

The results are given of a survey following a short but severe frost in 36 groves in 3 areas. No peel damage occurred with or without frost protection. Some frozen fruit recovered without serious pulp damage. Only a relatively small amount of leaf damage occurred in groves protected by wind machines as compared with groves without frost protection.

1255. MCCOWN, J. T.
Additional observations on Florida citrus following the 1957-58 freezes.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 75-7.

In continuing a survey of frost damage [see *H.A.*, 29: 2832] it was noted that trees which were 4 years old at the time of injury made the best recovery when pruned to 4 scaffold limbs. Earthing up trees older than those normally given this winter treatment and also pruning in April improved growth. Melanose attack following injury was reduced by pruning. In general, younger trees were recovering from frost injury more rapidly than older trees.—Fla agric. Ext. Serv., Gainesville.

1256. Yamamoto, S.
The effect of plant growth-hormones on the winter fruit-drop of *Citrus tamurana*. [Japanese, with English summary 4 lines.]
Bull. Fac. Agric. Univ. Miyazaki, 1960, **5**: 172-8, bibl. 8.

2,4-D, but not MH-30, was effective in preventing drop, which was worst after very low temperatures.

1257. Cahoon, G. A., and Stolzy, L. H.
Citrus root density in relation to water use.
Calif. Citrogr., 1960, **45**: 318, 323.

Studies of the root density–moisture depletion relationships on 3 types of soil by the neutron moderation method, combined with the gravimetric method of measuring root density, showed that the amount of moisture depleted from various soil depths was proportional to the density of feeder roots present. Differences recorded in apparent root efficiency may have been due to climatic and environmental causes. [See also *H.A.*, 30: 4316.] —Univ. Calif., Riverside.

1258. Horanic, G. E., and Gardner, F. E.
Relative wilting of orange trees on various rootstocks.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 77-9, bibl. 4.

After a prolonged dry period Parson Brown and Valencia orange trees wilted much more severely on grapefruit, sweet orange and Rusk citrange rootstocks than on sour orange, rough lemon or Cleopatra mandarin. Unbudded Parson Brown seedlings also showed severe wilting.—U.S.D.A., Orlando, Fla.

1259. Brewer, R. F., and others.
The effects of hydrogen fluoride gas on seven citrus varieties.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 236-43, bibl. 5, illus.

Prolonged exposure to hydrogen fluoride gas under greenhouse conditions was detrimental to all the varieties tested, but they did not respond alike. The apparent order of decreasing sensitivity was navel orange, Lisbon lemon, Valencia orange, Eureka lemon, red grapefruit, Marsh grapefruit and Temple orange. The magnitude of the detrimental physiological effects (decreased dry weight, vigour, leaf size and trunk diameters) of the fluoride fumigation were out of proportion to the amount of photosynthetic area rendered inactive by necrosis, thereby suggesting the presence of "hidden injury". Decreased leaf size and increased foliar chlorosis were the two most pronounced visible symptoms of prolonged exposure to low fluoride concentrations. Because of the wide variability in chlorosis patterns, sight diagnosis under field conditions would be extremely unreliable unless supported by chemical analyses of mature foliage. Marginal necrosis, the usual symptom of fluoride injury in other species, was observed on citrus only after exposure to relatively high fluoride concentrations (in excess of 15 p.p.b.). These high fluoride concentrations were the result of, and thereby accompanied by, unusually high ambient temperatures in the greenhouse fumigation chambers. [From authors' summary.]—Univ. Calif., Riverside.

Citrus—soil management and nutrition.

(*See also* 273, 1285, 1287, 1294, 1297, 1309, 1647, 1659.)

1260. Russo, F.
La pratica della "non-lavorazione" del terreno negli agrumeti. (**The practice of non-culture in citrus orchards.**)
Tecn. agric., 1959, **11**: 488-92.

Compared with trees subjected to root injury caused by ploughing to 15-25 cm. uncultivated trees given herbicidal treatment showed improved growth after the first year. In the third year improvements in growth and production were both very evident, and the soil structure below ploughing depth was improved. In other trials no differences have yet been noticed in comparison with superficial hand culture or rotovating.—Staz. sper. Agrumic., Acireale.

1261. Kretchman, D. W.
Chemical control of perennial grasses in citrus groves.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 21-9, bibl. 6.

Results are given of trials on the control of bermuda grass (*Cynodon dactylon*), maiden cane (*Panicum hemitomon*), guinea grass (*P. maximum*), para grass (*P. purpurascens*) and torpedo grass (*P. repens*). Dowpon (dalapon) and Karmex (diuron) were the main herbicides used, giving, in general, good control or appreciable reduction in grass infestation. Little or no injury was caused by repeated applications of Dowpon at 2 lb./acre or of Karmex at 8 and 12 lb./acre to healthy citrus trees which were 8 years old or older.—Fla Citrus Exp. Stat., Lake Alfred.

1262. Harrison, D. S.
Drainage criteria for flatwoods citrus.
Citrus Ind., 1960, **41**(7): 5-6, bibl. 4.

Open ditch and tile drainage systems compared.

1263. Sakamoto, T., and others.
Studies on the long term application of green manure to Satsuma orange. [Japanese, with English summary 2 pp.]
Bull. Ehime Fruit Tree Exp. Stat., 1960, No, 1, pp. 1-26, bibl. 22.

Observations were carried out for 13 years on 5 plots supplied with 100, 75, 50, 25 and 0% of green manure (lupin and broad bean), respectively. During the last 6 years the yields of trees on the 50, 75, 100% green manure plots increased considerably, whereas the trees on the plot with no green manure lost vigour and became unhealthy. The fruit increased in size and weight as the application of green manure increased, decay decreased, the sweetness ratio (total sugar/citric acid) increased and the fruit rind thickened and coarsened. The Ca and Mg contents of the leaves were higher in the sections having more green manure, and the root systems were well developed. The soil contained more humus and was in excellent condition, whereas on the plots which lacked green manure the soil was acid and of poor structure.

1264. Chapman, H. D.
Leaf and soil analysis as a guide to fertilizer practices.
Calif. Citrogr., 1960, **45**: 209-10, 230-3, bibl. 3.

Leaf and soil analysis values associated with high citrus yields are tabulated, and examples from orange groves provided as illustrations. The costs of soil and leaf analyses are discussed.

1265. Pennisi, L., and Scuderi, A.
Indagine sulla composizione minerale delle foglie di agrumi siciliani nel quadro della diagnostica fogliare. **(Investigations on the mineral composition of Sicilian citrus leaves by leaf analysis.)**
Tecn. agric., 1959, **11**: 515-31.

Analysis of 4–8-month-old leaves of several orange varieties and a lemon variety in productive orchards in the provinces of Catania and Syracuse showed that in general N and Ca contents were within the optimum limits, P and K were too high and Mg was low. Soil and leaf analysis figures are given. For example, in 4-month-old mandarin leaves the N, P, K, Ca and Mg contents were 2·45, 0·53, 3·67, 3·43 and 0·10% of dry matter, respectively, and the corresponding figures in 7-month-old leaves were 2·88, 0·71, 2·82, 3·40 and 0·27%.—Staz. sper. Agrumic., Acireale.

1266. Kosyh, S. A.
The effect of organo-mineral fertilizers on fruit set and yield of lemons on the southern coast of the Crimea. [Russian, with English summary ½ p.]
Subtrop. Kul'tury, 1959, No. 3, pp. 46-52, bibl. 4, illus.

Shedding of newly set fruits of lemons growing under glass was found to be mainly due to high air temperatures and low humidity. Shading and spraying did not give satisfactory control, but top dressing with organo-mineral liquid fertilizers improved the development of the trees, reduced fruit drop by 20–30% and increased yields. The best results were obtained in a lemon house when 6 applications at 10 l. per tree were made as follows: liquid FYM (1:10) + 80 g. ammonium sulphate + 20 g. K salt applied at the end of April and in the middle of May; liquid FYM + 25 g. ammonium sulphate + 50 g. superphosphate + 20 g. K salt applied twice in June; and liquid FYM or sewage + 80 g. superphosphate applied in the middle of July and at the beginning of August.

1267. Reitz, H. J., and Koo, R. C. J.
Effect of nitrogen and potassium fertilization on yield, fruit quality, and leaf analysis of Valencia orange.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 244-52, bibl. 16.
Effect of nitrogen and potassium fertilization on yield and fruit quality of Valencia orange on calcareous soil.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 14-16, bibl. 5.

Three levels of N [1·2, 1·8 and 2·4 lb. per tree per year] and 3 levels of K [0, 2·4 and 4·8 lb. K_2O] were applied factorially to bearing trees on a typical calcareous soil over a 6-year period. The higher levels of N fertilization resulted in dense, dark green foliage compared with the low levels, while K fertilization had little effect upon tree appearance. Both low N and high K resulted in noticeable Mg deficiency symptoms in the foliage. Yield of fruit was significantly reduced by low N from the second year of the experiment, but low K did not significantly influence yield until the sixth year. Both high N and high K increased the acidity of the juice and delayed maturity. High N increased the amount of green colour on the fruit. Increasing N tended to decrease fruit size, while increasing K tended to increase fruit size, with indications that the K effect was the greater. Other effects on fruit quality were of minor significance. [From authors' summary to first paper.]—Fla Citrus Exp. Stat., Lake Alfred.

1268. Platt, R. G.
California citrus and nitrogen.
Calif. Citrogr., 1960, **45**: 246, 251.

Reappraisal of the results of a 20-year fertilizer experiment showed that yields were influenced by rate of water infiltration as well as the amount of N present. The addition of manure as half the source of N increased the yield mainly because of its influence on soil tilth. The current recommendation is 1–1½ lb. N/tree/year for mature orange trees.

1269. CUTULI, G.
La concimazione azotata del limone con particolare riguardo all'uso dell'urea sotto forma d'irrorazione alla chioma. **(The nitrogenous fertilization of lemon trees with particular reference to the use of urea crown sprays.)**
Tecn. agric., 1959, **11**: 475-82, bibl. 30.

In a trial on Monachello and Femminello lemons the treatments were urea foliar spray (1% aqueous spray plus wetting agent) and soil applications of urea and ammonium nitrate. In the case of Femminello spraying was suspended because of tipburn after the 4th spray, the sprayed trees then having received 176 g. N each compared with 307–308 g. with the 2 soil treatments. The mean winter lemon yields in the Femminello treatments were 280, 157, 293 and 183 per tree with urea spray, urea soil application, ammonium nitrate and control, respectively. The corresponding forced summer fruit yields were 158, 155, 107 and 29 per tree, respectively.—Staz. sper. Agrumic., Acireale.

1270. JONES, W. W., AND EMBLETON, T. W.
Nitrogen—grade—packout relations in Valencias.
Calif. Citrogr., 1960, **45**: 241-2.

Excessive N applications, the highest of which was 3 lb. N per tree annually, reduced fruit size and the percentage of fruit packed. Yields were not significantly reduced by withholding N for 10 years where ½ lb./tree was applied in the irrigation water.

1271. BOUMA, D.
The effect of ammonium sulphate usage on the availability of soil phosphorus to citrus.
Aust. J. agric. Res., 1960, **11**: 292-303, bibl. 11.

Glasshouse experiments were carried out to study the effect of soil acidification, caused by the continuous use of ammonium sulphate, on the availability of soil P to citrus plants. The soils for the glasshouse experiments were sampled in a tilled and a permanent sod treatment of a factorial field experiment, each at several levels of ammonium sulphate. Nitrogen levels in the soil were equalized by the application of ammonium nitrate solutions. Growth and P uptake of lemon cuttings and orange seedlings were considerably better in soil from the no-ammonium sulphate plots than in soil from the high ammonium sulphate plots. The application of phosphate caused a marked increase in growth and P uptake only of plants grown in soil from the no-N plots. Increasing levels of superphosphate had very little effect if applied to the soil from the high ammonium sulphate plots. A considerably better response to superphosphate was obtained if applied to soil from limed plots, or applied together with a mixture of Ca and Mg silicate. A good response was also obtained to crushed rock phosphate. Analysis of soils indicated that in the acid, high ammonium sulphate soil a greater proportion of soil P was present as aluminium phosphate than in the no-ammonium sulphate soil. [From author's summary.]—C.S.I.R.O., Griffith, N.S.W.

1272. RASMUSSEN, G. K., AND SMITH, P. F.
Pot studies on the effect of superphosphates on the growth of citrus seedlings.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 71-5, bibl. 9, illus.

Pineapple orange seedlings were grown for 9 months in pots in a fine sand subsoil, to which 3 sources of PO_4 were added, each at 4 rates, with or without dolomite. The orange seedlings in the highest P (2,500 p.p.m.) subsoil died within 6 days of planting when the P was derived from superphosphate or triple superphosphate. Orange seedlings replanted into these pots made fair growth but not as good as those in subsoil with lower P levels. Rock phosphate at the rates used had no significant effect on growth. The highest rates of superphosphate and triple superphosphate, even in the presence of 4 g. of dolomite, depressed the soil reaction from an initial level of pH 6·0 to approximately pH 4·0. Rock phosphate did not affect pH. Results of several supplementary tests suggest that the free acid content of acidified phosphates is responsible for their deleterious effect on growth.—U.S. Dep. Agric., Orlando, Fla.

1273. TANAKA, Y., AND OTHERS.
Effects of phosphorus fertilization on *Citrus unshiu* Marc. I. A study on translocation and distribution of phosphorus applied to the soil or injected into the trunk of citrus trees using P^{32} as a tracer. [Japanese, with English summary ⅓ p.]
J. hort. Ass. Japan, 1960, **29**: 63-9, bibl 8, illus.

Labelled ammonium phosphate was applied to the soil or by injection to one side only of 20-year-old Satsuma orange trees in the field and in pots. The absorbed P accumulated on the treated side, little or none being found on the other side, and was greatest in the upper part of the tree. No difference was found due to age of leaves, and no radioactivity appeared in the fruit. When fertilizer was applied above and below the trees in a terraced grove, no difference in the rate of absorption was observed, but when it was broadcast on the soil under the crown the rate was higher than when it was restricted to the periphery of the crown.

1274. LABANAUSKAS, C. K., JONES, W. W., AND EMBLETON, T. W.
Influence of soil applications of nitrogen, phosphate, and potash on the micronutrient concentration in Washington Navel orange leaves.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 230-5, bibl. 16.

The concentrations of Zn, Cu, Mn, B and Fe in

Washington Navel orange leaves as affected by soil applications of urea, urea-phosphate, urea-potash and no fertilizer treatments for 19 consecutive years were studied in a long-term orchard experiment. Urea alone increased yield and growth of the trees over the check treatment appreciably, but the addition of phosphate or potash fertilizers was not effective in further increasing yield and growth. Soil pH was not affected significantly by soil applications of urea alone, urea-phosphate and urea-potash as compared to the pH of soil from the check treatment plot. Three pounds per tree per year of actual N from urea applied annually for 19 consecutive years significantly increased Mn and Fe concentrations in the leaves, whereas Zn, Cu and B were unaffected as compared to levels found in the leaves of unfertilized trees. Applications of 1 lb. of P_2O_5 in addition to 3 lb. of N to the trees significantly reduced Zn and Cu concentrations in the leaves, whereas Mn, B and Fe were unaffected, as compared to levels found in the leaves of N-treated trees. The addition of 1 lb. of K_2O from potassium sulphate to 3 lb. of N did not affect significantly the concentrations of Zn, Cu, Mn, B and Fe in the leaves as compared to levels found in the leaves of the N-treated trees. [Authors' summary.]—Univ. Calif. Citrus Exp. Stat., Riverside.

1275. Giovannini, E., and Fichera, P.
New diagnostic technique for micronutritional disorders of oranges. [Italian?]
Ric. sci., 1960, **30**: 128-37, from abstr. in *J. Sci. Food Agric.*, 1960, **11**: ii-57.

The effect of trace elements on the activity of chloroplast materials extracted from orange leaves was studied by a bioelectric potential method. The method provides a basis for studying micronutritional disorders by observing the effect of trace elements on the potential curve.

1276. Smith, P. F., and Rasmussen, G. K.
Field trials on the long-term effect of single applications of copper, zinc, and manganese on Florida sandy citrus soil.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 87-92, bibl. 13.

Broadcast applications of Cu, Zn and Mn as sulphate salts were made to areas of approximately 600 sq. ft. around 2-year-old Valencia orange trees on rough lemon. Three rates of each element in all combinations were used with 2 lime levels and 4 replications, making a total of 216 field plots of 2 trees each. Leaf analyses showed a continuing relationship to application rate of each element despite unduly high pH levels. Deficiency symptoms were observed only in some of the control trees or in those which received the lowest rate of Mn. There was some limited effect of one element on the uptake of another. High-lime strongly depressed the absorption of Mn and Zn, but had much less effect on Cu. After 5 years many of the combinations show promise of supplying the nutritional requirements of the trees for many more years. [From authors' summary.]—U. S. Dep. Agric., Orlando, Fla.

1277. Oertli, J. J.
The distribution of normal and toxic amounts of boron in leaves of rough lemon.
Agron. J., 1960, **52**: 530-2, bibl. 8, illus.

One-year-old seedlings growing in culture solution were irrigated 3 times with water containing 0 to 20 p.p.m. B as boric acid. Leaves showing various degrees of damage were harvested 2 months later and the distribution of B investigated. Injurious concentrations of B moved mainly into marginal and interveinal areas near the leaf tip, where concentrations could be 100 times higher than in the petiole. Symptoms of disorders in B nutrition were reflected in the B distribution in the leaves. Figures are given for toxic quantities of B in the chlorophyll.

1278. Averna, V., Petronici, C., and Bazan, E.
La nutrizione minerale degli agrumi. Nota 1. Studio pedochimico sui terreni della zona agrumicola di Bagheria (Palermo). **(The mineral nutrition of citrus. 1. A chemical study of the soils of the citrus areas of Bagheria (Palermo).)**
Petronici, C., and Averna, V.
Idem. Nota 2. Sui microelementi boro e molibdeno nei terreni della zona agrumicola di Bagheria (Palermo). **(Idem. 2. Boron and molybdenum in the soils of the same area.)**
Ann. Sper. agrar., 1960, **14**: 401-14, bibl. 20, and 415-28, bibl. 41.

The values for assimilable and total boron vary, respectively, from 0·10 to 2·0 and 15·62 to 650 p.p.m., and for assimilable and total molybdenum from 0·010 to 0·275 and from 0·68 to 2·80 p.p.m.

1279. (Lee, B. N.)
Copper deficiency in Ventura County.
Calif. Citrogr., 1960, **48**: 233.

Symptoms on oranges, and control by using copper-containing sprays.

1280. Raciti, G. B.
La cura della clorosi ferrica in Sicilia. **(Control of iron chlorosis in Sicily.)**
Tecn. agric., 1959, **11**: 407-10.

Of 18 products, chiefly iron chelates, tested on citrus between 1953 and 1958 only Chel H Fe 138, a powder containing 8% Fe, gave promising results. Applied to a single tree in 1957 it caused the foliage to turn green in about 25 days. In 1958 it was applied to a number of very chlorotic trees at 200–500 g. After about a month the foliage was almost completely green and the trees were growing normally. The product should be incorporated with the soil at 300 g. per tree.—Staz. sper. agrumic., Acireale.

1281. ANON.
Deficiencia de zinc en cítricas. (**Zinc deficiency in citrus.**)
Not. agríc. Serv. Shell Agric., 1960, **2**: 67-8, illus.

Foliar spraying with zinc sulphate is recommended, at an average of 30 g. in 12 l. per tree.

Citrus—growth and reproduction.

(*See also* 54, 296, 1266, 1267, 1328.)

1282. THULLBERY, H. A.
Hedging or removal of trees?
Citrus Mag., 1960, **22**(10): 25.

In half a 10-acre citrus grove every other tree was removed and in the other half all the trees were allowed to remain. After 6 years the thinned block still failed to produce as much fruit as the control, even though all the trees in the latter were hedged during the previous season and were more than 30 years old.

1283. LEVITT, E. C.
Pruning citrus trees.
Agric. Gaz. N.S.W., 1960, **71**: 175-7, illus., and *Fruit World, Melbourne*, 1960, **61**(6): 23-7, illus.

Establishment pruning, maintenance pruning and renovation pruning described.

1284. KESSLER, B., COHEN, A., AND MONSELISE, S. P.
The effect of purine and pyrimidine bases upon the seasonal changes of chlorophyll in citrus trees.
Bull. Res. Coun. Israel, Sect. D, 1960, **8D**: 151-8, bibl. 15.

The effect of adenine, caffeine, uracil and xanthine upon the seasonal changes of chlorophyll were studied. Adenine raised the chlorophyll level soon after its application. The level of chlorophyll in the adenine-treated trees remained significantly higher than that of untreated controls throughout the growing season. Caffeine, uracil and xanthine either had no effect or caused an initial decrease in the chlorophyll level. Later in the growing season the purines and pyrimidines stimulated chlorophyll synthesis, which then rose significantly above the level of the control trees and reached the level of the adenine-treated trees. There was no significant difference in the chlorophyll/DNA ratios obtained for treatments and control at any of the sampling dates. [From authors' abstract.]—Hebrew Univ., Rehovot.

1285. AYALON, S., AND MONSELISE, S. P.
Flower bud induction and differentiation in the Shamouti orange.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 216-21, bibl. 9.

In microscopic examinations of buds of Shamouti (Jaffa) orange pre-differentiation stages could not be detected before late January. Ringing and defoliation experiments showed that the flower induction stimulus (produced in the leaves) operates to a very small extent in November and December and is mainly operative in early January about 3 weeks before the first pre-differentiation stages could be detected. Urea sprays applied during the period November-January did not affect the percentage of flowering buds. Trees on sweet lime rootstocks had a significantly higher percentage of flower buds and a significantly higher N content in the leaves than trees on sour orange rootstocks. This higher leaf-N content of trees on sweet lime occurred both on unsprayed trees and trees sprayed with urea.—Hebrew Univ., Rehovot, Israel.

1286. BALDINI, E.
Contributo allo studio della differenziazione delle gemme nell'arancio. (**A contribution to the study of orange flower bud differentiation.**)
Tecn. agric., 1959, **11**: 388-97, bibl. 21, illus.

In the Tarocco orange the pre-differentiation phase (bud apices rounded and broadened) was observed in mid-January and the "orceolo" stage (further broadening of the bud apices and appearance of sepal primordia) at the end of January. When trees were progressively defoliated at the rate of one branch a fortnight from 30 October to 25 March, branches defoliated before mid-December produced no flower buds, while those defoliated thereafter did produce flower buds. The number of flower buds differentiated per branch reached a maximum (equal to the undefoliated control) in branches defoliated on 10 and 25 March, showing that differentiation virtually ceases after 10 March even in normal growing conditions. It was concluded that bud differentiation was effectively initiated between mid-December and mid-March.—Ist. Colt. arb., Univ. Sassari.

1287. DAMIGELLA, P., AND SQUILLACI, A.
Studio sulla biologia fiorale del "Clementine" e prove di messa a frutto di piante improduttive. (**Studies on the floral biology of the Clementine and on bringing unproductive trees into bearing.**)
Tecn. agric., 1959, **11**: 440-63, bibl. 17, illus.

A one-year investigation led to the following conclusions: (1) the pollen has very high germinating power; (2) fruit is produced either parthenocarpically or by self-fertilization, the degree of self-compatibility, although low, being sufficient to give a good yield; (3) ringing greatly increases yield, increases fruit size and reduces the mean number of pips; (4) a dressing of 0·8 kg. nitrate of lime per tree is sufficient; (5) foliar fertilization does not increase production.—Univ. Catania.

1288. Hassanein, M. H., and Ibrahim, M. M.
Studies on the importance of insects especially the honey bee in pollination of citrus in Egypt.
Agric. Res. Rev. Cairo, 1959, **37**: 390-409, bibl. 11, illus.

The honey bee proved to be the most frequent visitor to citrus blossom. The percentage of fruit set in Khalili orange when insects were excluded was 2·61, when honey bees were supplied artificially 10·4, and when free access was permitted 7·43.

1289. Ishida, Y., and Yakushiji, K.
Effect of bud and fruit thinning on the yield and quality of Satsuma orange. [Japanese, with English summary ½ p.]
Bull. Ehime Fruit Tree Exp. Stat., 1960, No. 1, pp. 27-42, bibl. 6.

The 4 thinning treatments compared were thinning to provide 25, 20 and 15 leaves per fruit and no thinning. The trees with 20 and 25 leaves per fruit gave regular yields of large fruit, whereas the unthinned trees were less vigorous with poor yields. Colouring, citric acid and soluble solids contents were best where there were 25 leaves per fruit and poorest in the unthinned trees. So-called puffy fruit comprised less than 20% of the crop of the trees with 20 and 25 leaves per fruit.

1290. Bean, R. C., and Todd, G. W.
Photosynthesis and respiration in developing fruits. I. $C^{14}O_2$ uptake by young oranges in light and in dark.
Plant Physiol., 1960, **35**: 425-9, bibl. 16.

A comparison was made of the amount of $C^{14}O_2$ fixed in tissues of intact small oranges and in orange tissue preparations in the light and in darkness. Studies were also made on the compounds into which the C^{14} was incorporated. The flavedo tissue (outer green peel) was found to be capable of rapid photosynthetic CO_2 fixation, whereas the albedo (inner white peel) and the juice vesicles showed very little photosynthetic capacity. In the dark the juice vesicles assimilated far more C^{14} than the other tissues, whether in the intact fruit or as isolated tissues. Malic acid, serine, aspartic acid and citric acid were the major labelled compounds formed in the orange tissues in darkness. [From authors' summary.]—Univ. Calif., Riverside.

1291. Bean, R. C.
Carbohydrate metabolism of citrus fruits. I. Mechanisms of sucrose synthesis in oranges and lemons.
Plant Physiol., 1960, **35**: 429-34, bibl. 15.

Formation of sucrose in oranges and lemons was studied using tracer techniques with isolated tissues and with intact small fruit. Sucrose synthesis was also studied. Soluble preparations from the juice of mature oranges catalyzed the reaction between uridine diphosphate glucose (UDPG) and free fructose to form sucrose. Soluble material from the juice of lemons was inactive, but particulate preparations were found to activate the same reaction. In isolated tissues (peel slices and excised vesicles) from lemons of all ages label [sic] from glucose-C^{14} or fructose-C^{14} was incorporated into sucrose. Sucrose was labelled in both hexose components no matter which monosaccharide was supplied. No labelling of the free fructose occurred when glucose was given. Albedo tissue from lemons had a relatively constant rate of incorporation of glucose activity into sucrose throughout the growth of the fruit, but the rate of incorporation in the flavedo and juice sacs fell off rapidly with increase in age. In the intact fruit glucose was incorporated into sucrose much more rapidly than fructose. [From author's summary.]—Univ. Calif., Riverside.

1292. Deszyck, E. J., and Ting, S. V.
Effect of lead arsenate sprays on dead wood, yield, fruit size, and drop of Marsh grapefruit.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 34-8, bibl. 9.

Lead arsenate at rates up to 3 lb. per 100 gal. was applied for 9 seasons to advance earliness in grapefruit. The sprayed trees produced less fruit of smaller size with slightly thicker rinds, and dropped fewer immature and pre-harvest fruit, than unsprayed trees. Dead wood tended to decrease with increasing arsenic application.—Fla Citrus Exp. Stat., Lake Alfred.

1293. Deszyck, E. J., and Ting, S. V.
Sugar composition, bioflavonoid content, and pH of grapefruit as affected by lead arsenate sprays.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 266-70, bibl. 15.

Spray experiments with lead arsenate, using up to 3 lb. per 100 gal., were conducted in a mature Marsh grapefruit orchard for 4 seasons and in 2 other orchards for shorter periods. Arsenated grapefruit of 3 varieties, Marsh, Duncan and Ruby Red, contained slightly less reducing sugar, significantly more non-reducing sugar, and more total sugar than unarsenated fruit. Bioflavonoid content and pH were also significantly higher in the sprayed Marsh and Ruby Red fruit. [Authors' summary.]—Fla Citrus Exp. Stat., Lake Alfred.

1294. Crescimanno, F. G.
Ricerche sulla forzatura del limone. **(Investigations on forcing lemons.)**
Tecn. agric., 1959, **11**: 398-406.

Fortnightly measurements from 10 October, 1958, to 21 August, 1959, of the forced fruit of Femminello lemon trees subjected to 6 different fertilizer treatments showed that there were no significant differences in fruit size related to fertilization. Growth was rapid for the first 6 weeks and then proceeded at a slower but constant rate up to the beginning of June, when the rate fell rapidly owing to the onset of the dry season. After 20 June growth was regulated by irrigation. Notes are also given on a trial in progress on clay soil, in which irrigation and no irrigation before the dry season are being compared.—Ist. Colt. arb., Univ. Palermo.

1295. ERICKSON, L. C.
Color development in Valencia oranges.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 257-61, bibl. 11.

Young Valencia orange fruits were grafted onto small plants of Cleopatra mandarin, which were kept either in the greenhouse or in a growth chamber. During 2 months' exposure to temperatures of 20° C. by day and 5° by night, the fruits became uniformly orange. They developed more total pigmentation, and retained less chlorophyll, than fruits which were exposed to temperatures of 30° by day and 10° by night or to greenhouse temperatures ranging from a minimum of 18° by night to a maximum of 28° by day. The fruit kept at the higher temperatures did not colour appreciably. Growth of the grafted fruit was not as great in the growth chambers as it was in the greenhouse. The juice of the grafted fruit was lower in sugars than that of orchard fruit, but the acid contents were not significantly different.—Univ. Calif., Riverside.

1296. OBERBACHER, M. F., TING, S. V., AND DESZYCK, E. J.
Internal color and carotenoid pigments of Burgundy grapefruit.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 262-5, bibl. 8.

The new variety of red grapefruit, Burgundy, is characterized by a very deep red flesh colour correlated with lycopene content. The red colour of this variety was much deeper than that of Ruby Red. The colour of both varieties faded as the season progressed, but the colour of the Burgundy flesh in the late part of the season was as intense as that of Ruby Red at the beginning of the season. The colour differences between these two varieties were maintained whether grown on rough lemon or sour orange rootstocks. [Authors' summary.]—Fla Citrus Exp. Stat., Lake Alfred.

Citrus—diseases.

(*See also* 1255, 1647, 1659.)

1297. MARIAKULANDAI, A., AND DURAIRAJ, D. J.
Some chemical aspects of mandarin orange decline in Wynaad.
South Indian Hort., 1958, **6**: 23-35, bibl. 9.

The incidence and severity of decline were found to be closely associated with steep slopes, shallow soils and soils low in the finer fractions and in available plant nutrients. Experimental injections of ammonium phosphate solution effected a temporary cure.

1298. SCHNEIDER, H.
Sieve-tube necrosis in nucellar lemon trees.
Calif. Citrogr., 1960, **45**: 208, 219-22, bibl. 8, illus.

Symptoms of the disease are described. Control can be obtained by the elimination of clones with which it is invariably associated and by propagating necrosis-free strains.

1299. EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANIZATION (E.P.P.O.)
Report of the international conference on virus diseases of citrus. [English and French.]
[*Publ.*] *E.P.P.O.*, 1960, pp. 103.

The diseases considered were xyloporosis, cachexia, psorosis, exocortis, chronic decline, lemon sieve-tube necrosis and sour orange rootstock necrosis, and the position in respect of these diseases in Cyprus, Greece, Yugoslavia, Italy, Spain, Portugal and France was discussed. Tristeza was not regarded as being prevalent in the Mediterranean area at the present time.

1300. REICHERT, I., AND OTHERS.
Tristeza disease in native commercial citrus trees in the Mediterranean.
FAO Plant Prot. Bull., 1960, **8**: 43-5, bibl. 12, illus.

Identified on Shamouti sweet oranges grafted on sour orange or sweet lime in Israel.

1301. MOREIRA, S.
Um novo problema para nossa citricultura. **(A new problem in our citrus growing.)** [English summary 8 lines.]
Rev. Agric. Piracicaba, 1960, **35**: 77-82, bibl. 12.

The orange variety Pera in São Paulo, Brazil, is highly susceptible to a disease which presents many of the symptoms of tristeza. Unless a strain of Pera showing high tolerance to the disease can be selected, this variety should be replaced by other late varieties such as Natal, Valencia or Lue Gim Gong.

1302. GRANT, T. J., JONES, J. W., AND NORMAN, G. G.
Present status of heat treatment of citrus viruses.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 45-8, bibl. 3, illus.

Tristeza infected citrus plants were treated in heat chambers at 95°±3° F. With increasing exposure the percentage of virus-free stem pieces increased, and with exposure periods of 360 days or more the virus was inactivated in the roots as well as in the tops of young potted Key limes. Maintaining plant roots in a sandy soil at temperatures 10–15° F. cooler than the air temperatures in which the tops developed resulted in increased top growth without reduction in the rate of virus inactivation. Work on the effect of heat treatment on xyloporosis and exocortis viruses is in progress.—U. S. Dep. Agric., Orlando, Fla.

1303. Grant, T. J., and Corbett, M. K.
Mechanical transmission of the infectious variegation virus of citrus.
Nature, 1960, **188**: 519-20, bibl. 8, illus.

Details are given of a rubbing technique with carborundum used to transmit the virus from Eureka lemon to sour orange and Eureka lemon. This is the first record of mechanical transmission of a citrus virus.—U.S.D.A., Orlando, Fla, and Univ. Fla, Gainesville.

1304. Crossa-Raynaud, P.
Les principales maladies des agrumes dans le bassin méditerranéen. Gommoses et maladies à virus. (**The chief citrus diseases in the Mediterranean basin. Gummosis and virus diseases.**)
Fruits et Prim., 1960, **30**: 99-106.

A general discussion of preventive and control measures.

1305. Mathews, W. H.
Greasy spot—fact or fancy?
Citrus Ind., 1960, **41**(6): 9, 11-12, bibl. 9, illus.

Greasy spot is caused by a *Cercospora* sp. Pink and red grapefruit are most susceptible followed by white grapefruit, tangelos and some oranges. Tangerines and Temples are least susceptible. Control is obtained with sprays of tri-basic copper sulphate at ½ lb./100 gal. or of zineb at 1 lb./100 gal., applied when the new leaves have matured. If defoliation has been severe in previous years, 2 sprays should be applied, 1 of copper applied during May and a regular oil-zineb spray for scale and mites applied in July.

1306. Pačulija, K. F.
The significance of the texture of lemon wood in relation to the entry and development of the fungus pathogen of mal secco. [Russian, with English summary ¼ p.]
Subtrop. Kul'tury, 1959, No. 2, pp. 40-3, bibl. 12.

Susceptibility to injury by *Deuterophoma tracheiphila* was associated with rank growth and relatively open wood texture. Examination of the wood could therefore serve to predict the susceptibility of varieties and lines.

1307. Moreira, S., and Salibe, A. A.
Eficiência de ditiocarbamato no contrôle da verrugose da laranja doce. (**Efficiency of dithiocarbamates for the control of scab in sweet orange.**) [English summary 10 lines.]
Bragantia, 1959, **18**: 319-25, bibl. 5, illus.

In trials for the control of scab (*Elsinoë australis*) on Pera oranges 1% bordeaux mixture, 0·8% Perenox and 0·4% Rhodiazinc were applied at 7 l. per tree, either once immediately after petal fall, or immediately after petal fall and again 3½ weeks later. With one application the treatments gave 50, 70 and 40% clean fruit, respectively, compared with 14% in the control. With two applications the corresponding figures were 77, 82 and 68%, respectively, compared with 12% in the control.

1308. (Loest, F. C., and van Oostrum, A.)
Control of black spot by pruning.
Citrus Gr, 1960, No. 319, p. 26.

Excellent control was obtained on the fruit of pruned Eureka lemon trees, whether sprayed with fungicide or left unsprayed, whereas the fruit of sprayed, unpruned trees was severely infected.

1309. Francaviglia, G.
Il marciume radicale e l'impianto dell' agrumeto. (**Root rot and the planting of citrus orchards.**)
Tecn. agric., 1959, **11**: 538-49, illus.

Recommendations on soils and their drainage, etc., to avoid root rot.

Citrus—pests.

(*See also* 1242, 1647, 1659, 1665.)

1310. Robson, J.
Advances in the control of citrus pests.
Outlook on Agric., 1960, **2**: 276-83, illus.

A review, referring particularly to mites, scale insects, mealy bugs and fruit flies.

1311. Michaelides, R. C.
Control of citrus pests.
Countryman, Nicosia, May-June 1960, pp. 4-7, illus.

In trials with insecticides not in general use Rogor 40 was effective against citrus red scale and zineb gave excellent control of rust mite. Chlorobenzilate apparently controlled citrus bud mite on sour lemon but needs further investigation.

1312. Franklin, W. W., and others.
Citrus insects of Liberia.
Stat. Note cent. agric. Exp. Stat., Liberia, 1959, No. 18, pp. 1-18, bibl. 9, illus., from *Trop. Abstr.*, 1960, **15**, Abstr. h1833.

The most important insect pests of citrus in Liberia are scale insects, grasshoppers and larvae of the butterfly *Papilio demodocus*. Parathion gave good control of the scales. Aldrin or chlordane controlled the following insects: larvae of the citrus papilio, grasshoppers, and black and gold scarab beetles, all of which can cause considerable defoliation of citrus during the dry season.

1313. Di Martino, E.
Lotta alle formiche negli agrumeti mediante trattamenti ai soli tronchi. (**Ant control in citrus orchards by stem treatment.**)
Tecn. agric., 1959, **11**: 411-16, bibl. 3.

Painting the stems of young orange trees with 5% chlordane w.p. 50 on 4 April reduced the percentage of trees infested with *Tapinoma nigerrimum* for periods of up to 2 months. For example, on 31 May only 40% of the treated trees were infested compared with 75% of the controls. In a trial begun on 21 May the trunks and branches of young lemon trees were sprayed with chlordane w.p. 50 at 5%, dieldrin emulsion 75 at 7% or DDT w.p. at 5%. Each treatment kept the trees free of ants for about 3 months.—Staz. sper. Agrumic., Acireale.

1314. ATKINS, E. L., JR.
The anise swallowtail butterfly on citrus.
Calif. Citrogr., 1960, **45**: 336-9, bibl. 6, illus.

The life history and the damage caused by the larvae of *Papilio zelicaon* are described. The green lacewing, *Apanteles lunatus* and *Pteromalus puparum* are natural enemies. Satisfactory control may be obtained by sprays of parathion, 2 lb. 25% w.p./100 gal. or DDT, 2 lb. 50% w.p./100 gal., or by dusts of 50% cryolite or 5% DDT in talc.—Univ. Calif., Riverside.

1315. MORI, S.
On the control of the fruit-sucking noctuid moth in an Early Satsuma orange orchard by fluorescent light traps. [Japanese, with English summary 1 p.]
Bull. Ehime Fruit Tree Exp. Stat., 1960, No. 1, pp. 65-75, bibl. 7, illus.

Fluorescent lights were effective in luring *Oraesia excavata* and *O. emarginata* from the trees but had no effect on *Adris tyrannus*. The lights were effective within 70–80 m. from the source. The moths were most active at temperatures of 24–25° C. and ceased activity when the temperature dropped below 10° C. More than 10 species were attracted and killed by the lamps.

1316. LEMAISTRE, J.
Progrès récents de la lutte contre la cératite (*Ceratitis capitata* Wied) dans les plantations d'agrumes et autres arbres fruitiers. (Revue bibliographique). **(Recent progress in the control of the Mediterranean fruit fly in plantations of citrus and other fruit trees. A bibliographical review.)** [English, German, Spanish and Russian summaries $\frac{1}{4}$ p. each.]
Fruits d'Outre Mer, 1960, **15**: 73-6, bibl. 15.

A short review, covering research on emergence with the aid of traps, the use of insecticidal baits in the trees and the destruction of damaged and fallen fruits.

1317. DI MARTINO, E.
Gli acari degli agrumi in Italia. **(Citrus mites in Italy.)**
Tecn. agric., 1959, **11**: 509-14, bibl. 6.

Notes are given on the biology, depredations and control of *Aceria sheldoni* and *Tetranychus telarius*. Control of the former is obtained with 0·3% chlorobenzilate E.25 or with 0·2% Aramite E 25 plus 0·2% Ovex E 25. Trials since 1953 have shown that control of *T. telarius* is obtainable with a number of products and mixtures, including 0·05% Aramite, 0·125% malathion, 0·02% parathion and 2% white oil, all combined with 0·5% Ovex.—Staz. sper. Agrumic., Acireale.

1318. TOUZEAU, J.
L'acarien du bourgeon des citrus en Tunisie. **(The citrus bud mite in Tunisia.)**
Tunis. agric., 1960, **61**: 59-68, 69-76, bibl. 4, illus.

Finely divided sulphur and oleoparathion were each superior to Aramite, chlorobenzilate, toxaphene or Kelthane in controlling bud mites (*Aceria sheldoni*) on lemon trees. Ekatin was unsatisfactory.

1319. MUNGER, F., GILMORE, J. E., AND CRESSMAN, A. W.
Citrus red mites resistant to demeton and Ovex and their response to Tedion and Kelthane.
J. econ. Ent., 1960, **53**: 384-8, bibl. 4, illus.

Strains of citrus mites (*Panonychus citri*) that had become resistant to demeton and Ovex by repeated spray treatments were collected for laboratory rearing and testing. The demeton-resistant mites, which were tested on green lemons, were found to be 163 times as resistant as a non-resistant strain. The Ovex-resistant mites were 131 times as resistant. No cross-tolerance to Tedion or Kelthane existed in either strain. Tedion was about 10 times as effective as Kelthane. [From authors' abstract.]—Agric. Res. Serv., U.S.D.A.

1320. JOHNSON, R. B.
The use of Tedion against citrus red mite and Texas citrus mite.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 51-6, bibl. 3.

Various amounts of Tedion 25W or equivalent dosages of Tedion 50W per 100 gal. were sprayed on the same Temple orange trees once each autumn for 3 successive years and in the spring of the 3rd year. Each year 0·5, 1·0 or 2·0 lb. of Tedion 25 controlled citrus red mite (*Panonychus citri*) and Texas citrus mite (*Eutetranychus banksi*) until after flowering in the following spring. The spring application of Tedion 50 at 0·125, 0·25 or 0·5 lb. controlled both mites until August or beyond. However, for general practice a single autumn application of 0·5 lb. Tedion 25W per year is recommended. Tedion was effective in sprays containing wettable sulphur, zineb, zineb + parathion, basic copper sulphate or NuZ.

1321. GRIFFITHS, J. T.
Field experience on some new miticides during the past twelve months on citrus in Florida.
Fla Ent., 1960, **43**(1): 29-35, from *Biol. Abstr., Sect. E*, 1960, **35**, Abstr. 45,972.

Results obtained with several acaricides on 5,000 acres of citrus suggest that, while zineb gives the best rust mite control, combinations with sulphur may also be satisfactory in the autumn, winter, and spring. Dosage experiments indicate that, on 13-year-old trees, zineb at the rate of 3 lb./65 trees is a satisfactory level.

1322. Johnson, R. B.
The effect of copper compounds on control of citrus rust mite with zineb.
J. econ. Ent., 1960, **53**: 395-7, bibl. 1.

Zineb was tested with 6 copper compounds and with basic copper sulphate plus emulsified oil or parathion against citrus rust mite, *Phyllocoptruta oleivora*. The dosage of 0·5 lb. 65% zineb per 100 gal. of water was far more effective than 10·0 lb. sulphur. All the copper compounds reduced the effectiveness of zineb in summer sprays, but not in post-bloom sprays. One pound of 65% zineb plus copper was superior to sulphur, although less effective than zineb alone. Emulsified oil, but not parathion, improved control with zineb in sprays containing copper. [From author's abstract.]—Fla Citrus Exp. Stat., Lake Alfred.

1323. Lavabre, M. E.
Présence au Cameroun du psylle des citrus, *Trioza* (*Spaniosa*) *erythreae* del G. (**The occurrence of the citrus psylla *Trioza* (*Spaniosa*) *erythreae* in Cameroun.**)
J. Agric. trop. Bot. appl., 1960, **7**: 132-4, bibl. 4, illus.

Endrin checked the spread of the pest, but poor results were achieved with Paraphene, DDT emulsion, Lindex, or Lindex plus Paraphene.

1324. Giunchi, P.
Le cocciniglie degli agrumi. (**Scale insect pests of citrus.**)
Progr. agric., 1960, **6**: 596-7, illus.

The dictyospermum scale (*Chrysomphalus dictyospermi*) can be controlled by fumigation with hydrogen cyanide, and the cottony cushion scale (*Pericerya purchasi*) by the predatory beetle *Rodolia* (*Novius*) *cardinalis*. Phosphoric esters in light oils are recommended against these and other related pests of citrus, viz. mealy bug (*Pseudococcus citri*), purple scale (*Mytilococcus beckii*), soft brown scale (*Coccus hesperidum*) and *Aspidiotus hederae*.

1325. Russo, G.
Le cocciniglie degli agrumi e relativi mezzi di lotta. (**The citrus scales and their control.**)
Tecn. agric., 1959, **11**: 354-87, illus.

Notes on 13 scale insects and advice on insecticides and HCN fumigation.

1326. Di Martino, E.
I bassi volumi per la distribuzione di oli minerali in agrumicoltura. (**Low-volume mineral-oil spraying in citrus growing.**)
Tecn. agric., 1959, **11**: 483-7, bibl. 3.

In trials on the control of *Mytilococcus beckii* on 20-year-old Sanguinello oranges with a summer mineral oil the spray was applied with a pre-compression pump at normal volume 2% concentration and with an atomizer at rates ranging from $\frac{1}{1}$ normal volume and 2% concentration to $\frac{1}{8}$ normal volume and 16% concentration. The pre-compression pump gave the best results, viz. 81% mortality, compared with 42–57% with the atomizer and 35% in the control. Leaf fall was much increased by the sprays during the 6 weeks after treatment, the weekly rate being 2, 6 and 7 times greater than in the control with pump application and with $\frac{1}{1}$ and $\frac{1}{8}$ normal volume spraying with the atomizer, respectively.

1327. Whitnall, A. B. M.
New thinking on chemical control of red scale.
Citrus Gr, 1960, No. 319, pp. 9, 11.

In 2 trials on 10-year-old trees the 10 different treatments compared included parathion 25% w.p., malathion 25% w.p., Gusathion 25% w.p. and Alboleum white oil emulsion containing 80% highly refined hydrocarbon oil by weight, either alone or in combination. Some trees received 1 spray, others 2. Results showed that 2 sprays were better than 1 and that good control was obtained with parathion alone (3 lb./100 gal.) or in combination with malathion.

1328. Thompson, W. L.
Leaf drop following spray applications on citrus.
Proc. Fla St. hort. Soc., *1959*, 1960, **72**: 29-34, bibl. 4.

Leaf drop was caused or increased by insecticidal sprays. The greatest drop occurred when insecticides were applied just before the time of normal leaf shedding. Regardless of the time of application, insecticides used for scale control produced leaf drop in the following descending order: parathion + 0·7% oil, Delnav+0·5% oil, Ethion+0·5% oil, parathion+0·5% oil, 1·3% oil, malathion +0·5% oil, Ethion, parathion, Delnav and malathion. Significantly more drop occurred when either basic copper sulphate or copper oxide was added to 2 gal. of lime-sulphur per 100 gal. than with lime-sulphur alone. A mixture of copper sulphate and lime-sulphur caused slightly more drop than lime-sulphur alone. [From author's summary.]—Fla Citrus Exp. Stat., Lake Alfred.

1329. del Rivero, J. M.
Influencia de la limitación de los residuos de los pesticidas en los agrios en su producción y comercio. (**The effect of limiting pesticide residues on citrus production and trade.**)
Bol. Inst. nac. Invest. agron. Madrid, 1960, **20**: 213-22, bibl. 6.

International agreement is urged on permissible limits and U.S. regulations are summarized.

1330. Stearns, C. R., Jr.
Importance of residues and tolerances of spray materials in marketing of citrus fruit.
Citrus Mag., 1960, **22**(9): 29.

The legal tolerances and waiting periods for spray materials commonly used on citrus in Florida are listed.

Citrus—fruit harvesting, packing and storage.

(*See also* 111.)

1331. Anon.
Grapefruit going into bins.
Western Fruit Gr, 1960, **14**(5): 39-40, illus.

Bulk harvesting using wire-bound bins 47 × 47 × 31 in. in size.

1332. Capel, G. L.
The quality of Florida grapefruit.
Citrus Ind., 1960, **41**(6): 16, 18-19.

Regulations on internal quality and external appearance discussed.

1333. Grierson, W., Hayward, F. W., and Oberbacher, M. F.
Simulated packing, shipping, and marketing experiments with Valencia oranges.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 248-54, bibl. 23, illus.

In 7 treatments tested the fruit was stored in perforated 5-lb. polythene bags packed in "bag-master" cartons. "Dowicooling" resulted in very good decay control up to the time of retail sale, but a sharp increase in decay occurred during a subsequent week at 70° F., though not at 50° F. Diphenyl pads in the cartons gave very good decay control both with "Dowicooled" and warm-packed fruit. Rapid air pre-cooling plus Dow-hex was not followed by a sharp increase in decay after removal to 70° F. as occurred following Dowicooling. Gloss was not materially decreased by any of the treatments, nor was colour affected. Dowicide residues as o-phenylphenol were well within the legal tolerance. —Fla Citrus Exp. Stat., Lake Alfred.

1334. Yost, G. E.
Converting conventional citrus packing stations to roll-board packing stations.
Citrus Mag., 1960, **22**(9): 22-3, 33, bibl. 3, illus.

By this method of packing citrus the graded fruit roll down an inclined plane towards the packer. Its several advantages over the conventional packing method are discussed.

1335. Jolley, L. C.
Heat effects on citrus fruit.
Citrus News, 1960, **36**: 23, 25.

Methods of cooling fruit, particularly during degreening.

1336. Murdock, D. I., Brokaw, C. H., and Folinazzo, J. F.
Should oranges for concentrate be initially washed before or after storage bins?
Citrus Ind., 1960, **41**(7): 7-8, bibl. 1.

A study of the effects of washing prior to bin storage on (1) microbial contamination of fruit surfaces, (2) fruit cleanliness, (3) grading efficiency and (4) physical breakdown of the fruit in the bins showed that, although there was no reduction in fruit surface contamination, the fruit handling equipment remained cleaner and initial grading was easier. No physical breakdown of the fruit occurred.

1337. Davis, P. L., and Harding, P. L.
Keeping quality of Marsh grapefruit after nitrogen and potash fertilization.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 83-7, bibl. 7., and *Citrus Mag.*, 1960, **22**(11): 18-20, 22, bibl. 7.

Marsh grapefruit, regardless of N or K treatment, developed little or no pitting when stored at 32° or 50° F. for 6 weeks and held at 70° F. for 1 week. Pitting developed in all samples stored at 40° F. for 6 weeks. More decay developed during 6 weeks storage at 50° than at 32° or 40° F., but during the subsequent holding period at 70° F. decay developed in most samples. Thus keeping quality was more closely related to storage temperature than to fertilization practices. [See also *H.A.*, 28: 2997.]—U.S.D.A., Orlando, Fla.

1338. Kiely, T. B., and Long, J. K.
Market diseases of citrus.
Agric. Gaz. N.S.W., 1960, **71**: 132-5, 157, 187-92, illus., and *Fruit World, Melbourne*, 1960, **61**(5): 23, 25, and **61**(6): 31-2.

Green and blue mould rots, stem end rot, brown rot, sour rot, black spot, septoria spot, melanose, scab, sooty mould and sooty blotch described with control measures.

1339. Moreau, C.
La "moisissure grise" des oranges. **(Grey mould of oranges.)** [English, German, Spanish and Russian summaries ¼ p. each.]
Fruits d'Outre Mer, 1960, **15**: 69-71, bibl. 4, illus.

Damage from *Botrytis cinerea* during storage and transport can be reduced by improved ventilation and disinfection of the atmosphere.

1340. Hellinger, E.
A new type of citrus fruit rot caused by *P. italicum* Wehmer.
Nature, 1960, **188**: 424-5.

On oranges kept in a closed container in the presence of diphenyl.

1341. Hayward, F. W., and Grierson, W.
Effects of treatment conditions on *o*-phenylphenol residues in oranges.
J. agric. Food Chem., 1960, **8**: 308-10, bibl. 9.

Sodium o-phenylphenate is effective as a post-harvest fungicide in controlling decay of citrus fruits, but it sometimes causes peel injury. A study was made of the effects of treatment conditions on residues of o-phenylphenol in oranges. Residues increased with concentration, temperature and length of treatment, but decreased as pH was raised. By control of treatment conditions residues can be maintained at any desired level. Peel injury was not a problem when residues were below the legal tolerance of 10 p.p.m. [Authors' summary.] —Citrus Exp. Stat., Lake Alfred, Fla.

Dates.

(*See also* 1218.)

1342. Crowther, P. C., and Smith, E. H. G.
Dates from the Eastern Aden protectorate.
Trop. Sci., 1960, **2**: 90-2, bibl. 6.

Chemical and physical analyses of dried dates of 5 varieties.

Feijoas.

1343. Kvarachelija, M. S.
Propagating feijoa from seed. [Russian with English summary ½ p.]
Subtrop. Kul'tury, 1959, No. 1, pp. 62-5, illus.

Feijoa sellowiana is frost-resistant, and seedlings can be obtained ready for transplanting in a single season, provided the seeds are germinated in a hot house and the seedlings are given adequate attention.

1344. Taylor, J. B., and Joiner, J. N.
Vegetative propagation of *Feijoa sellowiana* and *Rhodomyrtus tomentosa* as affected by various combinations of 3-indolebutyric acid, arginine, sucrose and thiamine.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 366-8, bibl. 7.

Cuttings of *Feijoa sellowiana* and *Rhodomyrtus tomentosa* were soaked in the growth substances for 24 hours and were then inserted in a sterilized 40:60 mixture by volume of peat and perlite. Constant mist was provided during daytime. Feijoa cuttings failed to root regardless of treatment. The percentage of rooting and length of roots of the rhodomyrtus cuttings were not affected by treatments, but the quality of the roots was enhanced by IBA. Arginine, sucrose or thiamine, used separately or in combination with each other, produced poor results, and, when added to IBA, tended to counteract the effect of the acid.—Univ. Fla, Gainesville.

Litchis.

1345. Goldweber, S.
Observations on lychees grown in pot culture.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 353-6, bibl. 3, illus.

Young litchi trees were potted in gravel and given 6 treatments consisting of a complete solution and the same solution with N, P, K, Mg or Ca omitted. Brief descriptions are given of the effects of these treatments on deficiency symptoms, as indicated by leaf patterns, flowering and fruiting, leaf drop and root development.—Univ. Miami.

1346. Joiner, J. N.
The effects of differential levels of nitrogen, potassium and magnesium on the growth of lychees.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 346-8, bibl. 3.

Air-layered litchi trees were placed under sand culture conditions and given nutrient treatments consisting of 3 levels each of N (30, 80 and 210 p.p.m.), K (8, 32 and 180 p.p.m.) and Mg (12, 24 and 54 p.p.m.). Increasing N levels significantly reduced the growth rate, slightly depressed the content of leaf K, very significantly reduced the K content of the fibrous roots and decreased Mg uptake. As the K level was increased the growth rate was again significantly reduced, leaf N was increased and the Mg content of the tissue was reduced. Apparently the adverse effect of N on K and Mg, and of K on Mg, accumulation in the root system was the reason for the depressing effect of these two elements on growth. [From author's summary.]—Univ. Fla, Gainesville.

1347. Das, C. S., and Choudhury, K. R.
Floral biology of litchi (*Litchi chinensis* Sonn).
South Indian Hort., 1958, **6**: 17-22, bibl. 5.

Details are given of the flowering period, the varietal differences in length, spread and number of floral branches, and the effect of sunlight on flowering. Fruit set was found to range from 1·06 to 0·16%, largely depending on the district, and anther dehiscence took place throughout the day and night.

1348. Mustard, M. J., and Lynch, S. J.
Notes on lychee panicle development.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 324-7, illus.

About 76% of the September terminal flushes produced panicles the following spring, compared with only 42 and 36% of the October and November flushes, respectively. The panicle could be distinguished visually about 6 weeks before flowering.

1349. Gaskins, M. H.
Effects of certain plant growth regulators upon cold hardiness of lychees.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 339-41, bibl. 8.

Sprays of 10 p.p.m. dalapon and 500 p.p.m. maleic hydrazide increased the cold resistance of the leaves of small litchi trees. These treatments retarded growth, but apparently caused no permanent damage. Dalapon at 100 p.p.m. and maleic hydrazide at 1,000 p.p.m. appeared to cause more injury to the plants than the cold treatments used in this experiment. [From author's summary.]

1350. Campbell, C. W.
Storage behavior of fresh Brewster and Bengal lychees.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 356-60, bibl. 7.

Brewster and Bengal litchis were stored at 35, 45, 60 and 70° F. for 3 to 36 days. All fruit stored in open baskets became unsaleable within 3 days owing to severe discolouration. Fruit stored in perforated polythene bags at 35° and 45° F. showed some decay after 3 weeks, but in fruit that remained sound good flavour was maintained for 5 weeks. The quality of fruit held in polythene bags at 60 and 70° F. deteriorated rapidly owing to discolouration and decay.—U.S.D.A., Miami.

1351. Choudhury, J. K., and Banerjee, H.
Physiological changes in *Litchi* during storage at normal and low temperature.
Indian J. Plant Physiol., 1959, **2**: 141-4, bibl. 8.

Mature litchis kept at 36–38° F. and a R.H. of 80–85% remained in a normal condition for 1 month after harvesting and in a semi-dried condition for over 2 months. Colour and skin texture changed in 2–3 days. The vitamin C content was nil after 2 weeks' storage. The sugar content increased, but there was little change in dry weight, moisture, alcohol soluble solids and acid present in the pulp during the first 4 weeks' storage. At 89–93° F. the fruit did not keep even for a week.—Presidency Coll., Calcutta.

Olives.

(*See also* 1406, 1482.)

1352. Zito, F.
L'olivicoltura italiana nella Comunità Economica Europea. **(Italian olive growing in the European Economic Community.)**
Progr. agric., 1960, **6**: 793-802, illus., and *Tecn. agric.*, 1960, **12**: 115-26, illus.

Production and consumption of olive oil in Italy; competition with seed oils.

1353. Žigarevič, I. A., and Kamarinskij, A. M.
Possibilities of commercial development of olive growing in the U.S.S.R., and the production of pickled olives and olive oil. [Russian, with English summary $\frac{3}{4}$ p.]
Subtrop. Kul'tury, 1959, No. 4, pp. 60-9.

At present only 500–600 ha. are under olives, yielding 150–200 tons per annum. Means of extending production are outlined.

1354. Žigarevič, I. A.
The biology of the vegetative growth in bearing olive trees. [Russian, with English summary $\frac{1}{2}$ p.]
Subtrop. Kul'tury, 1959, No. 4, pp. 70-82, bibl. 9, illus.

In Azerbajdžan healthy, bearing olive trees have 2 phases of shoot growth, viz. an intensive phase in the spring and early summer with an average extension growth of 21·4 cm. per vegetative shoot and 15·4 cm. per fruiting shoot, and a less active phase in the autumn with extension growth of 7·8 cm. and 2·4 cm., respectively. In some varieties and under certain conditions, however, there may be only one growth phase. For abundant growth and high yields the trees should be provided with adequate nutrients and water during the period of intensive growth. Trees in which growth has slowed down should be thinned and their 2–3-year-old branches given a rejuvenating pruning.

1355. Spina, P.
Prove di concimazione fogliare dell'olivo. **(Experiments on foliar nutrition of olives.)**
Olearia, 1960, **14**: 14-19, bibl. 35.

Proprietary foliar fertilizers containing N, P, K and minor elements were applied for 2 consecutive years to trees of the olive variety Moresca in Catania (Sicily). The results varied markedly from tree to tree and did not justify the practical adoption of this method of fertilizer application.—Ist. Colt. arbor., Univ. Catania.

1356. Panetsos, C. G.
Contribution to the study of the biology of the olive tree flower (*Olea europaea* L.). [Greek, with English summary 2 pp.]
[Publ.] agric. Coll. Athens, 1958, pp. 81 bibl. 77, illus.

Microscopic examination of the differentiation of flower bud tissue was carried out on the apex of the lowest lateral branch of the inflorescence, since this develops earliest of all the branches. It was possible to observe flower bud development from the end of January until full bloom (3 months), and to increase the percentage of perfect flowers by the application of fertilizers during the critical period of differentiation. Flower bud differentiation was not affected by defoliation or ringing, if these were performed after 11 January, but the formation of the floral organs was seriously affected. Defoliation of the Kalamata variety reduced the percentage of perfect flowers, whereas ringing increased it.

1357. Maxie, E. C., Catlin, P. B., and Hartmann, H. T.
Respiration and ripening of olive fruits.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 275-91, bibl. 18.

The respiratory drift of olive fruits was studied from 3 weeks after full-bloom to senescence. The detached olive fruit shows no clear-cut autogenous climacteric related to ripening at temperatures between 59° and 95° F. The olive fruit may undergo a climacteric in respiration while on the tree. Ethylene and 2,4-D had but little effect on the rates of respiration and ripening of olive fruits at 68° F. However, fruits treated with ethylene at 77° F. or higher showed an immediate and very marked stimulation of respiration. The green colour was quickly bleached from the fruit, though red colour development and softening were not affected. Olive fruits treated with 2,4-D at 77° F. showed an immediate and marked increase in respiration, fading of green colour, increasing red colour and an increasing softening rate. Because 2,4-D injured the fruit, it could not be used to stimulate ripening in olives destined for processing. [Authors' summary.]—Univ. Calif., Davis.

1358. Arambourg, Y.
Contribution à l'étude de *Prays oleaellus* Fabr. (Lep. Hyponomeutidae) en Tunisie. Cycle biologique et essais de lutte en 1957. **(A contribution to the study of *Prays oleellus* in Tunisia. The biological cycle and control trials in 1957.)**
Ann. Serv. bot. agron. Tunisie, 1957 (issued 1960), **30**: 45-72, bibl. 9.

Demeton and its methyl derivative were slow in action but very effective against the larvae of the moth *Prays oleellus*, if applied very thoroughly to the olive trees when the first eggs were deposited, and again at fruit set. Demeton at 5 c.c. in 7 l. per tree was 100% effective in 21 days, but to achieve this result with the methyl derivative the dose had to be 6 times as high. Neither product was toxic to the trees, even during flowering, and the predatory insects were not harmed unless they were in direct contact with the spray jet. Olive trees, particularly old ones, absorb systemic insecticides extremely slowly.

1359. Picci, G.
Ancora sulla microflora presente nelle olive colpite da *Dacus oleae* Gmel. **(Further information on the microflora present in olives attacked by *Dacus oleae*.)**
Ann. Fac. Agrar. Univ. Pisa, 1959, **20**: 65-78, bibl. 4, illus.

The species and strains of bacteria, yeasts and other fungi found in fly-damaged olives are listed. Practically all of them are lipolitic.

1360. Albonico, F., and Vodret, A.
Ulteriore contributo alla conoscenza del contenuto di acidi grassi insaturi dell'olio di oliva di pressione. **(A further contribution to the knowledge of the content of unsaturated fatty acids in expressed olive oil.)**
Olearia, 1960, **14**: 57-60, bibl. 3.

The total content of oleic, linoleic and linolenic acids in 96 samples of olive oil from many areas of Italy varied only slightly, and rarely fell below 80%. Only in the case of oleic acid was there a tendency towards regional variation, with higher values in the north than in the south.

1361. Vitagliano, M., and Vodret, A.
Sulla possibilità di una migliore oleificazione delle olive. **(The possibility of extracting a higher quality oil from olives.)** [French, English and German summaries about 8 lines each.]
Olearia, 1960, **14**: 137-41, bibl. 15.

Lipase inhibitors (monosodium phosphate, citric acid and ascorbic acid), used during extraction, reduced the acidity of olive oil by 15–25% and decreased its tendency to become rancid.

Passion fruit.

1362. N.Z. Department of Agriculture, Horticulture Division.
Passion vine wilt and collar rot.
Orchard. N. Z., 1960, **33**: 225.

Vines grafted onto seedlings of *Passiflora edulis* var. *flavicarpa*, which are resistant to the causal *Fusarium* sp., have become well established.

1363. Kinch, D. M.
A passion fruit centrifuge.
Trans. Amer. Soc. agric. Engrs, 1959, **2**: 52-4, 57, reprinted in *Food Pres. Quart.*, 1960, **20**: 34-9, bibl. 2, illus.

A method for separating the juice sacs containing the seeds from the rinds, developed in Hawaii for continuous processing.

Persimmons.

1364. Ten'kovceva, Ė. S.
The selection of pollinators for the standard varieties of persimmon. [Russian, with English summary ¼ p.]
Subtrop. Kul'tury, 1959, No. 2, pp. 53-7, bibl. 4, illus.

Most of the 8 commercial varieties of persimmon grown in subtropical U.S.S.R. produce only pistillate flowers. The varieties Zenji-Maru, Shogotsu-Gaki and Pollinator No. 8 have proved the most effective pollinators, No. 8 being the most suitable for early flowering varieties.

Pomegranates.

1365. Srivastava, B. K.
The *anar* fruit borer.
Indian Fmg, 1960, **10**(1): 9-10, illus.

The life history of *Virachole isocrates*, a pest of pomegranates, is described. Methods of control include hand picking, and the application of endrin e.c., 2 lb./gal., at full bloom, followed by a second application 15–20 days later.

Tung.

(*See also* 1406, 1669.)

1366. Neff, M. S., Crane, H. L., and Barrows, H. L.
Effects of thinning fruit of Lampton seedling tung trees on growth, yield, and fruit and leaf composition.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 326-8, bibl. 2.

Leaf areas of less than 2,866 sq. cm. per fruit materially reduced, but greater leaf areas did not increase, the percentage of oil in the whole fruit. There was, however, a direct relationship between leaf area in one year and yield and oil production in the following year. The results of a fruit thinning experiment here described suggest that the pronounced biennial bearing tendency of the tung tree could be overcome by thinning the fruit.—Agric. Res. Serv., U.S.D.A.

TROPICAL FRUIT AND PLANTATION CROPS.

General.

(*See also* 1679.)

1367. Lazo Rodríguez, F.
La multiplicación de diversas especies de frutas tropicales. (**The propagation of various species of tropical fruits.**)
Proc. Carib. Reg. Amer. Soc. hort. Sci., *1957*, 1958, **5**: 6-11.

Notes on methods that have proved successful in Cuba for raising rootstocks for, and budding, mamey (*Mammea americana*), sapodilla, acerola, avocado, mango, sweetsop (*Annona squamosa*) and soursop (*A. muricata*).—Agric. Exp. Stat., Minist. Agric., Cuba.

1368. Wycherley, P. R.
Seed germination of some tropical legumes.
J. Rubb. Res. Inst. Malaya, 1960, **16**: 99-117, bibl. 5.

Calopogonium mucunoides, *Centrosema pubescens*, *Pueraria phaseoloides*, and *Flemingia congesta* were studied. Storage under humid conditions reduced, but mechanical and chemical scarification increased, germination of the seeds of all 4 species. Dry warmth promoted germination in *Pueraria* and to a lesser extent in *Centrosema*, and a brief irradiation with infrared lamps produced a marked response in *Flemingia*. Only minor responses to Gibrel and kinetin were obtained.

1369. Anon.
Seed treatment and sowing methods for cover crops.
Plant. Bull. R.R.I.M., 1960, No. 50, pp. 94-8, illus.

A machine for scarifying the seeds of *Calopogonium*, *Centrosema*, *Desmodium*, *Flemingia* and *Pueraria*, to assist germination, is described. Methods of giving these seeds acid and heat treatments are also detailed.

1370. van Dinther, J. B. M.
Insect pests of cultivated plants in Surinam.
Bull. LandbProefst. Suriname **76**, 1960, pp. 159, bibl. 6 pp., illus.

Including notes on control measures.

Areca palms.

1371. Indian Central Arecanut Committee.
Tenth Annual Report of the Indian Central Arecanut Committee, 1958-59, 1960, pp. 119.

The research programme summarized in the report was mostly carried out at the central research station in Mysore State and also at 5 regional stations in Assam, South and North Kerala, Mysore and West Bengal. The percentage germination of seed nuts was found to increase with the weight of the nut. Seeds just covered with soil gave significantly higher germination than seeds planted 2 in. or more below the surface. Storage for more than 7 days after harvest markedly reduced viability, but if the seeds were treated with fungicide and stored in dry sawdust the loss of viability was much less. Husked nuts germinated better than half husked or unhusked nuts. The most effective acaricides proved to be Folidol and Systox. No significant responses were obtained to applications of N, P, K and lime.

1372. Paul, S. C.
On arecanut (*Areca catechu* Linn. Palmae) seedling raising at the sub-Himalayan West Bengal.
Arecanut J., 1960, **10**: 166-73, bibl. 5.

The seed nuts should be collected from 25–30-year-old palms in the last week of May and sown immediately at 1 × 1 ft. spacing in raised beds. For shade and green manuring *Boga medeola* and *Crotalaria anagyroides* should be used, and both irrigation in the dry season and drainage in the monsoon are essential.—Reg. Arecanut Res. Stat., West Bengal.

1373. Naidu, G. V. B.
A note on the "pseudo budrot" of arecanut.
Arecanut J., 1960, **10**: 161-5, bibl. 5, illus.

This disease, which attacks only young (3–5-year-old) palms, is attributed to 2 gram-negative bacilli. Infected parts should be removed and the plants sprayed with 2% Ceresan, and this spray should be used as a prophylactic throughout the affected garden.—Reg. Arecanut Res. Stat., Kyatasandra.

Bananas.

(*See also* 125, 1218, 1659.)

1374. Shepherd, K.
Seed fertility of "Gros Michel" bananas.
Trop. Agriculture Trin., 1960, **37**: 211-21, bibl. 9.

Further data are presented on the variation in seed yields of Gros Michel pollinated at different times and at different sites. Fluctuation in time is partitioned into two fractions, one seasonal, the other uncertain but in part connected with the age of the field. General soil fertility, as measured by the average size of the fruit bunch, is shown to be important, but experiments show no practical advantage from the fertilizer applications tried. Yields are also shown to be influenced appreciably by the pruning practice adopted, by the age of the flowers when pollinated and by the source of the pollen, despite the close affinity of the pollen parents used. [Author's summary. See also *H.A.*, 24: 1921.]—Imp. Coll. trop. Agric., Trinidad.

1375. Tobar Mariño, G.
Algunos cruzamientos interspecíficos en *Musa*. (**Some interspecific crosses in *Musa*.**) [English summary ¾ p.]
Acta agron. Palmira, 1959, **9**: 35-49, bibl. 18, illus.

Using *Musa acuminata* and *M. balbisiana* as pollen parents, crosses were attempted with 2 parthenocarpic clones of *M. paradisiaca*. Of the 5 seeds produced, only one germinated, the male parent being *M. balbisiana* and the female from the Hartón clone of *M. paradisiaca*. The number of fruits per bunch increased by 8·8% in this clone and by 6·4% in the Maqueño clone as a result of artificial pollination.

1376. Cassidy, N. G.
A varietal difference in the need of bananas for good drainage.
Agric. J. Dep. Agric. Fiji, 1959, **29**: 133-6.

With the variety Veimama a water table higher than 36 in. below the surface resulted in decreased growth, whereas healthy stools of Cavendish and Lady's Finger existed where the water table was above 24 in.

1377. Dabin, B., and Leneuf, N.
Les sols de bananeraies de la Côte-d'Ivoire. (**The soils of the banana producing areas of the Ivory Coast.**) [English, German, Spanish and Russian summaries.]
Fruits d'Outre Mer, 1960, **15**: 3-27, 77-88, 117-27, bibl. 12, illus., map.

A detailed physical and chemical study.

1378. Dugain, F.
Étude sur la fertilité des sols de la plaine bananière du Cameroun. (**A study on the fertility of soils in the Cameroun banana plain.**) [English, German, Spanish and Russian summaries ¼ p. each.]
Fruits d'Outre Mer, 1960, **15**: 153-70, bibl. 6.

Physical properties of the soil, notably porosity, as related to the growth of the plant.

1379. Dumas, J.
Contrôle de nutrition de quelques bananeraies dans trois territoires africains. (**Checking nutrition in some banana plantations in three African territories.**) [English, German, Spanish and Russian summaries ¼ p. each.]
Fruits d'Outre Mer, 1960, **15**: 277-90.

The fertilizer needs of Gros Michel bananas in Cameroun, Poyo in the Ivory Coast and Petite Naine in Guinea are considered in the light of plant analysis data. In general, the importance of organic matter is stressed. The potash contents of the plants should be approximately 3·6% for Petite Naine, 4·0% for Poyo and 4·3–5·8% for Gros Michel. Nitrogen nutrition was found to be generally adequate.—Inst. franç. Rech. fruit. Outre-Mer.

1380. Shmueli, E.
Chilling and frost damage in banana leaves.
Bull. Res. Coun. Israel, Sect. D, 1960, **8D**: 225-38, bibl. 13, illus.

Frost injury in the leaves began at a temperature of −1·5° C. to −2·0° C., a duration of 10–15 minutes being sufficient to cause damage. Osmotic pressure in leaves not injured by frost never exceeded 15 atm. Upon the occurrence of frost injury it rose to 17–21 atm. just prior to the death of the leaves. Chilling damage occurred at temperatures close to 0° C. The injury, which manifests itself by yellowing and watery spots, appears gradually and seems to be connected with the age of leaf and plant. The appearance of these symptoms is followed by an increase in the osmotic pressure of affected parts. In fruit-bearing plants chilling leads to accelerated senescence and early death of the leaves. The mature leaves of suckers suffer localized injury but may recover. The relationship between the high sensitivity of the banana plant to drought and to low temperatures is discussed, and it is suggested that a similarity exists between chilling injury and senescence. [From author's abstract.]—Agric. Res. Stat., Rehovoth–Beit Dagan.

1381. Prest, R. L., and Smith, A. E.
Spikeleaf in banana.
Qd agric. J., 1960, **86**: 283-5, illus.

The symptoms, which are described, appear to be due to injury to the apical meristem of the corm during winter chilling and are prolonged by strong winds, soil erosion and other factors which slow down the rate of plant growth. Possible remedies include the selection of land with a warm slope and north-easterly aspect, avoidance of planting at low elevations, refraining from applying fertilizers from mid-April to early September and avoiding over-watering during the cooler months of the year.

1382. Klein, H. H.
Control of cercospora leaf spot of bananas with applications of oil sprays based on the disease cycle.
Phytopathology, 1960, **50**: 488-90, bibl. 5, coloured plate.

A method of estimating the intensity of the disease, which permitted the effective scheduling of oil spray applications for control, is described. Successive symptoms are classified as yellow streaks, brown streaks, and spots, to provide an index as to when oil should be applied. Texaco 522 oil applied to yellow streaks prevented further development into spots. However, oil did not prevent yellow streaks from appearing, nor did it effectively stop development of brown streaks into spots. Yellow streaks numbered 0–2,000 per leaf on the 2nd to 4th youngest leaves. When the number of yellow streaks was high, the volume of oil was increased from 0·8 to 1·0–1·5 gal. per acre. The effectiveness of the oil lasted no more than 24 hours under field conditions. The method has successfully controlled the disease on 30,000 acres.—Tela Railroad Co., La Lima, Honduras.

1383. Price, D.
Climate and control of banana leaf spot.
Span, 1960, **3**: 122-4, bibl. 3.

Fruit rejection in the Cameroons, due to leaf spot infection, was greatest in May and September. Laboratory tests showed that liberation of ascospores of *Mycosphaerella musicola* was greatest after alternately drying and re-wetting pieces of infected leaves. Oil spraying is therefore most necessary in periods with alternate rain and sun, such as occur at the beginning and end of the rainy period. [See also *H.A.*, 29: 2929.]—Cameroons Dev. Corp.

1384. Price, D.
Effects of several spray régimes on banana fruit weights.
Trop. Agriculture Trin., 1960, **37**: 325-8.

Five treatments were used against *Mycosphaerella musicola* on Gros Michel, viz. (1) 3% water-based cuprous oxide at 40 l. per acre, (2) 60% emulsion containing 250 g. cuprous oxide at 10 l., (3) 60% oil emulsion at 10 l., (4) 5 l. of oil containing 10% copper oxychloride per acre, and (5) 5 l. of oil per acre. All treatments with oil reduced fruit weight, in comparison with the water-based fungicide. Observations suggested that oil spraying reduced leaf efficiency. Emulsion- and oil-treated plants were more prone to wind damage than those given the water-based copper treatments.—Cameroons Dev. Corp.

1385. Meredith, D. S.
Banana fruit-spot ("speckle") caused by *Deightoniella torulosa* (Syd.) Ell.
Nature, 1960, **187**: 961-2, bibl. 8.

Evidence on causal organism obtained with Jamaican Lacatan bananas: control measures are not discussed.

1386. Loos, C. A., and Loos, S. B.
The black-head disease of bananas (*Musa acuminata*).
Proc. helminth. Soc. Wash., 1960, **27**: 189-93, bibl. 16, illus.

The disease caused by *Radopholus similis* is described, but no control measures are suggested. Infection usually originates from the planting material. Gros Michel plants could not be infected by strains of nematodes taken from Lacatan and vice versa.

1387. Blake, C.
Radopholus root rot of bananas.
Banana Bull., 1960, **23**(8): 6.

A trial, in which suckers were immersed for 30 min. in water at 55° C. prior to planting, has resulted in the area remaining free of *R. similis* for 2 seasons. [See also *H.A.*, 29: 4020.]

1388. Merino M., G., and Hernández, D.
Efecto del toxafeno en el combate de la oruga peluda de la hoja del banano, *Ceramidia viridis* (Druce) (Lepidoptera: Amatidae). **(The effect of toxaphene in controlling the hairy caterpillar, *Ceramidia viridis*, on banana leaves.)** [English summary 9 lines.]
Turrialba, 1959, **9**: 123-6, bibl. 3, illus.

Toxaphene applied at 3·8 lb. per ha., diluted to form 21 l. of liquid, gave very good control of the larvae of *C. viridis* on banana plants spaced at 5 × 5 m. Higher concentrations of the insecticide were no better. The treatment was effective for nearly 3 weeks.—Serv. co-op. interamer. Agric.

1389. Deullin, R., and Monnet, J.
Mesure de la plénitude de la banane. **(Determination of fullness in a banana.)**
Fruits d'Outre Mer, 1960, **15**: 205-22, bibl. 4, illus.

A more exact determination of fullness in the banana than can be visually obtained is desirable, and in this article an attempt is made to provide a suitable formula based on the surface of the median transverse section of the fruit. Figures, tables and graphs explain the system proposed.

1390. Blake, C. D.
Squirter and black-end diseases of bananas.
Banana Bull., 1960, **23**(6): 7.

Control is by dipping the cased fruit in a solution of the sodium salt of salicylanilide.

1391. Deullin, R.
Le navire bananier. **(The banana boat.)** [English, German, Spanish and Russian summaries ⅓ p. each.]
Fruits d'Outre Mer, 1960, **15**: 99-116, bibl. 9, illus.

A detailed account, with particular reference to refrigeration, ventilation and stowage.

1392. Flechtenmacher, W.
Ripening of bananas.
Kältetechnik, 1960, **12**: 44-9, bibl. 10, from abstr. in *J. Sci. Food Agric.*, 1960, **11**: ii-76.

A review, with some experimental results.

Cacao.

(*See also* 1642, 1648, 1659.)

1393. Hernández S., A.
Consideraciones referentes al cultivo del cacao en Venezuela. **(Observations on cacao growing in Venezuela.)**
Ing. agron., 1959, No. 3, pp. 16-20, bibl. 5, illus.

History, production from 1830 to 1959, diseases, breeding and selection.

1394. Bridgland, L. A.
Cacao improvement programme, Keravat.
Papua New Guinea agric. J., 1960, **12**: 149-67, bibl. 8, illus.

Clonal seed production, including notes on the adverse effects of in-breeding.

1395. Hardy, F.
The effects of air temperature on growth and production in cacao.
Cacao, Turrialba, 1958, **3**(17): 1-14, bibl. 15.

Temperature data for 4 typical cacao areas are tabulated, and the effects of air temperature on various physiological processes of the tree are described. The temperature limits for cacao are set at 60° F. and 86° F. (mean monthly minimum and maximum), and the effects of temperature variations and other climatic factors are discussed.

1396. Havord, G.
The nutrition and shade requirements of cacao. [Spanish summary 11 lines.]
Turrialba, 1959, **9**: 138-48, bibl. 70.

A review of investigations carried out in the West Indies, West Africa and Ceylon, covering major and minor elements and the effects of shading on nutrition.

1397. Lavabre, M. E.
Étude sur l'ombrage du cacaoyer. **(A study on the shading of cacao.)**
J. Agric. trop. Bot. appl., 1959, **6**: 685-90, bibl. 2.

Shade in cacao plantations can be dispensed with only when conditions are outstandingly good, and where growers are able to maintain the necessary intensive cultural system. In West Africa such conditions are generally lacking, and shade is essential to prevent capsid infestation and invasion by competing grasses. Based on an extensive survey, a classification of shade trees as good, moderately good and harmful is presented.

1398. Zamora, P. M., Orlido, N. M., and Capinpin, J. M.
Ontogenetic and embryological studies in *Theobroma cacao* Linn.
Philipp. Agric., 1960, **43**: 613-36, bibl. 36.

Floral morphology and development.

1399. Thresh, J. M., and Tinsley, T. W.
The virus complex causing swollen shoot disease of cacao in West Africa.
FAO Plant Prot. Bull., 1960, **8**: 65-9, bibl. 11, illus.

The cacao swollen shoot viruses occur in symptomatically distinct forms, isolates from which differ in host range and in transmissibility by the various mealy-bug vectors. Isolates from the same trees, epidemics or districts usually afford protection against each other but not against isolates from elsewhere, suggesting that the complex can be arranged into groups, within which, but not between which, the strains interprotect.—W.A.C.R.I., Ibadan.

1400. Thresh, J. M.
Capsids as a factor influencing the effect of swollen-shoot disease on cacao in Nigeria.
Emp. J. exp. Agric., 1960, **28**: 193-200, bibl. 12.

The condition of the trees was more closely related to the incidence of capsid damage and associated die-back caused by *Calonectria rigidiuscula* than it was to swollen-shoot virus infection. Indeed, where capsid damage was slight or where it was controlled by spraying, the effect of virus was less marked than that due to other factors influencing growth and yield. By comparison, where capsid damage was severe and not controlled, virus infected trees were worse than their neighbours and often died within a few years. [From author's summary.]—W.A.C.R.I., Ibadan.

1401. Turner, P. D.
Distribution of strains of *Phytophthora palmivora* from *Theobroma cacao* in West Africa.
FAO Plant Prot. Bull., 1960, **8**: 53-4, bibl. 5.

Survey of distribution and characteristics of 179 isolates.

1402. Wharton, A. L., and Burge, G. A.
Black pod disease of cocoa in Ghana.
Ghana Fmr, 1960, **4**(1): 18-23, illus.

Control methods advocated include the removal of all diseased cherelles and pods at weekly intervals, particularly from April to July, more frequent harvesting of mature pods, regular thinning of the canopy, the removal of unnecessary forest trees and adequate capsid control.

1403. Holliday, P.
A spraying and harvesting trial in Trinidad against cocoa pod diseases.
Trop. Agriculture Trin., 1960, **37**: 235-42, bibl. 17.

Spraying copper oxychloride (Blitox) at 10–30 gal./acre during the wet season reduced black pod (*Phytophthora palmivora*) by up to 67%, and frequent harvesting reduced it by up to 41%. Spraying increased the yield of healthy pods by 48% and frequent harvesting by 22%, the respective increases in the yield of dry cocoa being 22 and 31%.

1404. Stelzer, M. J.
Costa Rican cacao insects: their role in cherelle wilt and effect on yield.
Diss. Abstr., 1960, **21**: 4, being *L.C. Card No. Mic.* 60-2438 of 96 pp.

A survey of insects associated with cacao in Costa Rica showed that a very large and complex insect population is being supported, with no single species causing spectacular damage. Sucking insects (aphids, leafhoppers and treehoppers) greatly increased the incidence of cherelle wilt by feeding and oviposition in the pedicels of developing cherelles; small pods (under 2 cm. long) were very susceptible to insect attack. Attacks by *Amastris obtegens* were especially detrimental to pod development, and caused a reduction in wet bean weight of 20 g. per pod in pods harvested from unshaded, mature seedling cacao. Reductions in wet bean weights of pods from shaded trees were also significant. After 18 monthly treatment cycles, in which DDT and dieldrin were applied alone and in combination with bordeaux mixture, no significant differences were evident in the numbers of fruits set, harvested, wilted or infected by *Phytophthora* among treated or control plots. In another series of experiments the average number of pods harvested from dieldrin-treated trees was almost double that from the control trees, and yield figures have begun to show that plots receiving dieldrin, either alone or with bordeaux, are gradually outstripping all other treatments. The dieldrin treatment also seems to be reducing the incidence of cherelle wilt.—Univ. Wis.

1405. Mendes Ferrao, J. E.
Influência do processo de secagem no teor de aminoácidos essenciais de cacaus de S.Tomé. **(Influence of the drying process on the essential amino acid content of S.Tomé cocoas.)**
Agron. Angolana, 1959, **11**, 29-37, from *Trop. Abstr.*, 1960, **15**, Abstr. h2096.

Kiln drying, as compared with sun drying, appears to result in a decrease in amino acid content, and 2 essential acids, methionine and arginine, were not found in the samples studied.

Coconuts.

(*See also* 1482, 1647, 1648, 1681.)

1406. Commonwealth Economic Committee.
Vegetable oils and oilseeds.
[*Publ.*] *Commonw. econ. Cttee*, 1960, pp. 207, 10s.

Production and trade in oil-bearing crops including coconuts, oil palms, olives, castor and tung.

1407. Aiyangar, R. S.
A brief note on coconut cultivation in Mysore.
Lal-Baugh, 1959, **4**(4): 8-16.

Mainly concerned with nursery care and planting out.

1408. Liyanage, D. V.
Varieties and forms of the coconut palm grown in Ceylon.
Ceylon Coconut Quart., 1958, **9**(3/4): 1-10, bibl. 7, illus., [received 1960].

The indigenous coconut palms have been grouped into 3 varieties. The variety *typica*, of which there are 8 forms, is tall in habit, flowers late and is predominantly outbreeding; *nana*, with 3 forms, is short, early flowering and mainly inbreeding; *aurantiaca* is intermediate in height, flowers late, is inbreeding, has nuts of an orange colour and occurs in 2 forms.

1409. Satyabalan, K., and Lakshmanachar, M. S.
Coconut breeding: effects of some breeding procedures.
Indian Coconut J., 1960, **13**: 94-100, bibl. 8.

Variability in progenies was not significantly reduced by self-pollination compared with open pollination, but vigour and yield were markedly reduced. Selfing is regarded as unsuitable for coconut breeding.—Cent. Coconut Res. Stat., Kasaragod.

1410. Nambiar, M. C., and Swaminathan, M. S.
Meiosis in pollen sterile and pollen fertile varieties of coconut.
Curr. Sci., 1960, **29**: 234-6, bibl. 5, illus.

Pollen sterility in the varieties Dwarf Red and Apricot attributed to aberrant meiotic behaviour.

1411. Marar, M. M. K., and Jayarajan, T. G.
Coconut nursery studies—Effect of the method of collecting seednuts on germination of nuts and vigour of seedlings.
Indian Coconut J., 1960, **13**: 89-93, bibl. 1.

The effect was studied of lowering seed nuts by ropes, instead of allowing them to fall from the palms, on germination percentage and time, and on girth, height and number of leaves in the seedlings. The only significant difference was in the number of leaves produced by the seedlings, which was slightly in favour of the lowered nuts.—Cent. Coconut Res. Stat., Kasaragod.

1412. Davis, T. A.
Clonal propagation in coconuts.
Curr. Sci., 1960, **29**: 273, bibl. 4, illus.

Clones have been obtained from rarely occurring suckers and branches, and the production of 2 suckers from a sprout has been induced by dividing the growing point.—Cent. Coconut Res. Stat., Kerala.

1413. FAO.
Studies on the effect of rainfall on coconut crops.
[*Publ.*] *FAO* **CCP/Coconut/60/6,** 1960, pp. 9.

Preliminary data from a Ceylon estate showed that both the average yield per palm and the number of nuts required to produce a ton of copra were related to total annual rainfall in the current and the previous year. On this estate, which had an average yield of 77 nuts per palm, an average outturn of 4,930 nuts to the metric ton of copra and an average annual rainfall of 59 in., a change of 10 in. in the annual rainfall was found to result in a net change of 4 nuts per palm in the following year (holding constant the influence of rainfall in that year), and a net change in the copra outturn in the following year of 180 nuts per metric ton. The influence of rainfall on yields and on the copra outturn in the same year was also significant but only about half as important as the effect on the succeeding year's crop. When the annual rainfall fell below 50 in. the yield of nuts and the copra outturn the following year were more sharply affected than when rainfall exceeded the average.

1414. FAO.
The relation between rainfall and coconut crops.
Coconut Sit., FAO, 1959, No. 1, pp. 4-8.

Data from Malaya indicated a positive correlation between the monthly production of copra and the rainfall for a 3-month period, 7 to 9 months previously.

1415. Santhirasegaram, K., and Salmond, B.
Studies on the nutrient status of some coconut soils in Ceylon. 3. The forest soil at Ambakelley. (B) Optimum requirements of deficient nutrients.
Ceylon Coconut Quart., 1958, **9**(3/4): 30-9, bibl. 3, [received 1960].

The results of the preliminary experiments on this soil [see *H.A.*, 28:960k], which indicated N, P and K deficiency, were confirmed by 2 factorial experiments. There was a large and increasing response to N, and repeated small applications of ammonium sulphate are recommended. The optimum doses of P and K are considered to be 1½ cwt. sodium dihydrogenphosphate and 1½ cwt. sulphate of potash per acre.

1416. Velasco, J. R., de Guzman, E. V., and Mercado, B. T.
Growth of young coconut plant in sand culture.
Philipp. Agric., 1960, **43**: 548-76, bibl. 5, illus.

Trials were carried out to study nutrient deficiency symptoms, to note their time of appearance after withdrawal of the nutrient element and the time required to recover upon supplying the element again, and also to determine the chemical composition of the leaves of plants suffering from deficiencies. Total N was low in plants deficient in N and also Ca; P was high in young plants and decreased with age; K was low in K-, Ca- and Mg-deficient plants; and Ca was low in Ca- and S-deficient treatments but higher than the control in N- and micronutrient-deficient plants. Mg was low in the Mg-deficient treatment only.

1417. Tammes, P. M. L.
Nutrients in the giant embryosac-vacuole of the coconut.
Acta bot. neerl., 1959, **8**: 493-6, bibl. 5.

Nutrients present in the leaf tissue, which were also found, though in smaller quantities, in the vacuole of the embryo-sac, were P, Ca, Mg, Co, Mn, Mo and Zn; K was also present in the embryo-sac but at similar levels to those found in the leaf tissue. Neither Cu nor Fe was found in the vacuole sap, although both were present in leaf tissue.

1418. Charles, A. E.
Coconut lightning strike.
Papua New Guinea agric. J., 1960, **12**: 192-5, bibl. 2, illus.

An observed lightning strike in New Britain resulted in the death of 23 palms, 16 of which showed no visible injury at the time. These delayed deaths are attributed to weakening induced by initial shock leading to invasion by pathogens.

1419. van Weerdt, L. G., Martinez, A. P., and Esser, R. P.
Results of a survey designed to determine the etiology of "lethal yellowing" of *Cocos nucifera* L.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 421-30, bibl. 13.

The identity of the coconut blight in Key West with the lethal yellowing disease of Jamaican palms was confirmed. The disease could not be attributed to adverse soil conditions or to insects, fungi, bacteria or the nematode *Aphelenchoides coccophilus*, although the possibility that the nematodes *Rotylenchus* sp. or *Xiphinema* spp. may disseminate the disease requires investigation. Replanting with fully resistant dwarf coconuts appears to be the only practical method of control.

1420. Fiskell, J. G. A., Martinez, A. P., and van Weerdt, L. G.
Chemical studies on the roots and leaves of coconut palms affected by lethal yellowing.
Proc. Fla St. hort. Soc., 1959, 1960, **72**: 408-13, bibl. 6.

Although the chemical composition of the leaves and roots of the palms sampled showed a very wide range, indicative of very variable soil conditions, there was a tendency towards lower K values in the leaflets of diseased trees. This might be associated with infestation by the rootknot nematode, which has a high K requirement and can cause nutritional injury unless excess K is supplied.—Fla agric. Exp. Stat., and St. Plant Board Fla, Gainesville.

1421. Cachan, P.
Étude épidémiologique de la zygène (*Chalconicles catori* Jordan) des cocotiers et des palmiers à huile en Côte d'Ivoire. **(An epidemiological study of the zygaenid moth *Chalconicles catori* on coconuts and oil palms in the Ivory Coast.)**
J. Agric. trop. Bot. appl., 1959, **6**: 653-74, bibl. 5, illus.

Aerial application of 0·037% DDT to infested coconut palms and oil palms was very effective against the larvae of *C. catori*, less so against the pupae, and practically useless against the eggs. Treatment was economic only when carried out at the beginning of infestation.

1422. O'Connor, B. A.
Aerial spraying of coconut palms to control the coconut stick insect, *Graeffea crouani* Le Guill.
Agric. J. Dep. Agric. Fiji, 1959, **29**: 138-41, bibl. 1, illus.

Very high mortality was observed with a single spray of 4·4 oz. BHC in 2·2 gal. diesoline per acre. It is suggested that complete control could be obtained by giving a second spray 4 months later.

1423. Surany, P.
Diseases and biological control in rhinoceros beetles, *Oryctes* spp. (Scarabaeidae, Coleoptera). [French summary 1 p.]
Tech. Pap. S. Pacific Commiss. **128**, 1960, pp. 62, bibl. 7 pp., illus.

The results of a 4-year survey of diseases of *Oryctes rhinoceros* and *O. monoceros* are outlined and discussed.

1424. Wickremasuriya, C. A.
An improved injection technique for coconut palms of special relevance to the control of red weevil *Rhynchophorus ferrugineus* (F.).
Ceylon Coconut Quart., 1958, **9**(3/4): 40-54, bibl. 26, illus., [received 1960].

The author describes 2 methods of injecting liquids into the trees, namely the "serial type" method, in which the liquid circulates under pressure through a series of holes bored in the trunk, the pressure varying with the height of the reservoir, and the "parallel type", in which the holes are fed by parallel connections from the reservoir without circulation. The second method, using Malatox and Dieldrex Extra, was successful against red weevil and had no deleterious effect on the trees.

1425. FAO.
Analysis of costs and margins in the marketing of copra.
[*Publ.*] *FAO* **CCP/Coconut/WPQ/60/5**, 1960, pp. 6 + 2.

In addition to a discussion and a schedule, a supplementary paper provides 2 examples of actual costs from India, dated 1940.

1426. Nair, R. G.
Coir's place among Indian fibres.
Coconut Bull., 1960, **14**: 97-103, illus.

India is the world's largest producer of coir and coir products, and the processing of this fibre is described.

Coffee—general.

(*See also* 1642, 1659.)

1427. U.S. Dep. Agric., Foreign Agricultural Service.
World coffee crop expected to be smaller in 1960-61.
Foreign Agric. Circ. U.S. Dep. Agric. **FCOF 2-60,** 1960, pp. 12.

At 71·3 m. bags, about 10% below the record 1959-60 crop.

1428. Anon.
Analysis of European-owned coffee estates by district, acreage and yield for the six years 1954-55 to 1959-60
Kenya Coffee, 1960, **25**: 266-9.

In Kenya.

1429. Sills, V. E.
Rural industries. 3. Coffee.
Agric. J. Dep. Agric. Fiji, 1959, **29**: 148-52, bibl. 1, illus.

Advice on varieties, methods of cultivation and processing suitable for the peasant grower.

1430. Cole, K. S.
Robusta coffee in south-east Papua.
Papua New Guinea agric. J., 1960, **12**: 168-79, illus.

Advice on growing the crop.

1431. Suárez de Castro, F.
Investigación sobre café. **(Coffee research.)**
Agric. trop. Bogotá, 1960, **16**: 114-22, bibl. 38, and 171-6.

A review of experimental results from various countries, and suggestions for improving research facilities.

Coffee—breeding and culture.

(*See also* 18, 1452, 1648, 1652, 1669.)

1432. Carvalho, A.
Genética de *Coffea*. XXIV. Mutantes de *Coffea arabica* procedentes da Etiópia. **(Coffee genetics. XXIV. *Coffea arabica* mutants from Ethiopia.)** [English summary 1 p.]
Bragantia, 1959, **18**: 353-71, bibl. 11, illus.

Eritrean moca coffee is identical with the semperflorens mutant. There is strong evidence that the bourbon variety originated in Ethiopia, and not, as was formerly believed, on Réunion Island. The variety abyssinica is genetically related to typica, but its constitution is not fully known. The large-seeded variety macrocarpa has not been analysed genetically. Several other variations, including types with semi-erect branching and persistent calyxes, are noted. [For part XXIII, see *H.A.*, 29: 960f; see also *H.A.*, 29: 3068 l.]

1433. Carvalho, A., and Mônaco, L. C.
Híbridos entre *Coffea* e *Psilanthopsis*. **(Hybrids between *Coffea* and *Psilanthopsis*.)** [English summary ¾ p.]
Bragantia, 1959, **18**: xxi-xxix, bibl. 7, illus.

As *Psilanthopsis kapakata* is drought resistant, its hybridization with coffee may prove of economic interest. With the former species as pollen parent, the percentage of fruits produced was 55 in *Coffea arabica*, 17 in *C. canephora*, 13 in *C. eugenioides* and 2 in *C. dewevrei*, but the corresponding percentages of seedlings raised from normal hybrid seeds were 8, 35, 48 and 0. The morphological characteristics of various hybrids are briefly described. The restoration of *Psilanthopsis* to its original systematic position in the genus *Coffea* is proposed.

1434. Carvalho, A.
A energia nuclear e o cafeeiro. **(Nuclear energy and the coffee plant.)**
Bol. Super. Serv. Café, S. Paulo, 1959, **34**(394): 5-6.

Coffee seeds treated with X-rays at intensities up to 25,000 units produced healthy seedlings, but at higher dosages, although germination was not inhibited, the seedlings subsequently died. Certain mutants with modified leaf shape are under investigation. Recent work on γ-irradiation of coffee plants with radioactive cobalt in Costa Rica is summarized [see *H.A.*, 30: 2877].

1435. Stessels, L.
Établissement de plantations clonales de caféier Robusta au départ d'un faible nombre de boutures initiales. **(Establishing clonal plantations of robusta coffee from a limited number of cuttings.)**
Bull. Inf. I.N.É.A.C., 1960, **9**: 189-98.

The effects of 3 methods of manuring and 3 types of cultural treatment on the production of cuttings for building up a coffee plantation were compared. The greatest number of cuttings over a 5-year period was obtained from a combination of compost and mineral fertilizer, and arching-over the stem gave 64% more cuttings than early cutting back and 12% more than late cutting back.

1436. Leon, J.
Comparison of two systems of "agobio" in young plants of arabica coffee.
Coffee, Turrialba, 1960, **2**(4): 1-5, bibl. 5, illus.

The 2 systems tested were common agobio, in which the tree is bent over in an arc and the tip of the leader tethered to the ground, and root agobio, in which some of the roots on one side are severed and the trees inclined at an angle of 40° on this side. Significant differences were found in the production and growth of shoots and in trunk circumference in favour of common agobio. Over 3 seasons the common agobio system also gave more than twice the crop of the root agobio. The differences were more marked in the varieties typica and bourbon than in villalobos, which has a smaller, more compact root system.—I.A.I.A.S., Turrialba, Costa Rica.

1437. Sylvain, P. G., and others.
Coffee soil management and fertilizer use. A résumé of 24 papers.
Coffee Cacao train. Mat., 1960, No. 20, pp. 71, bibl. 2.

Most of these 24 papers have already been abstracted in *H.A.*, Vols 21–28. In addition to these, this résumé includes the following: J. A. Bonnet (1947) on the nutritional value of lime to coffee on acid soils; G. Chaverri, E. Bornemisza and F. Chaves (1957) on foliar analysis; L. A. Gomez, J. Leria Esmoris and B. G. Capo (1946) on coffee fertilizer requirements for a clay soil; M. E. Peralta (1952) on coffee leaf composition and Mn toxicity; and J. L. Villafuerte Paredes (1954) on nutritional disorders of coffee in Costa Rica.

1438. Müller, L. E.
Algunas deficiencias minerales comunes en el cafeto (*Coffea arabica* L.). **(Some mineral deficiencies common in coffee plants.)**
Bol. téc. Inst. interamer. Cien. agríc. Turrialba **4**, 1959, pp. 41, bibl. 44, illus.

This well-produced review is illustrated by colour photographs, and deals separately with deficiencies of N, P, K, Ca, Mg, Fe, Mn, B and Zn in coffee. It includes a key to foliar diagnosis by visible symptoms.

1439. Müller, L. [E.]
La applicación del diagnóstico foliar en el cafeto (*Coffea arabica* L.) para una mejor fertilización. **(The application of foliar diagnosis in arabica coffee to improve fertilization.)** [English summary ¼ p.]
Turrialba, 1959, **9**: 110-22, bibl. 23.

The choice of the 4th leaf (or 4th pair of leaves) from the shoot tip for analysis is not entirely satisfactory in determining nutritional status, except possibly as regards K. Deficiencies of N, P, K and Mg are much more readily detectable in the oldest leaves from the bearing part of the branch. Changes in foliar N, P, K, Ca, Mg, Mn and B in relation to ageing are shown graphically.

1440. Parra H., J.
El valor fertilizante de la pulpa de café. **(The manurial value of coffee pulp.)**
Cenicafé, 1959, **10**: 441-60, bibl. 18, illus.

In pot experiments with young coffee plants 81 manurial treatments were applied, involving combinations of 3 levels each of N, P, K and decomposed coffee pulp. The effects on the weight of whole plants, shoots and roots, on leaf composition and on the succulence of shoot and root tissues are recorded in tables, and the composition of the pulp is given. The coffee pulp gave outstandingly good results in every respect. The marked difference in growth response to 20 and 40 tons of pulp per ha. was progressively reduced by adding increasing amounts of K. Response to P was positive, but on a much smaller scale than that to pulp. The effect of N alone was unfavourable.

1441. Brauer H., O.
Destrucción de malas hierbas en los plantíos de café. **(Weed control in coffee plantations.)**
Proc. Carib. Reg. Amer. Soc. hort. Sci., 1957, 1958, **5**: 55-7, bibl. 3.

The principal weeds of Mexican plantations, with notes on their chemical control.

1442. Dadant, R.
Pourriture de l'écorce des *Albizzia stipulata* à Madagascar. **(Bark rot of *Albizzia stipulata* in Madagascar.)**
Bull. Inst. Rech. agron. Madagascar, 1959, No. 3, pp. 84-5, bibl. 1, illus.

A disease of this coffee shade tree, caused by a *Phytophthora* sp., is described. Its replacement by *Inga dulcis* is suggested.

Coffee—flowering and pollination.

1443. Alvim, P. de T.
Moisture stress as a requirement for flowering of coffee.
Science, 1960, **132**: 354, bibl. 7, illus.

Ten-year-old typica plants were either irrigated weekly or irrigated only when soil moisture approached wilting point at 1 ft. deep. The weekly irrigated plants did not flower, but those under the dry regime flowered 10–11 days after each irrigation. Water stress appears to be essential to break bud dormancy. [See also *H.A.*, 29: 2968.]

1444. Dublin, P.
Biologie florale du *Coffea dewevrei* de Wild race *excelsa* A. Chevalier. Troisieme partie. Floraison, pollinisation, fécondation. (**Floral biology of *Coffea excelsa*. 3. Flowering, pollination and fertilization.**) [English and Spanish summaries ¾ p. each.]
Agron. trop., Paris, 1960, **15**: 189-212, bibl. 22, illus.

In the Central African Republic *C. excelsa* flowers in March/April, compared with December/January for *C. canephora*. The floral pause is not of great significance and flowering may be induced by rainfall of less than 1 mm. Pollination is by wind and insects. The species is less prone to serious fruit drop than *C. canephora*, losses usually being confined to unfertilized fruits.—Centr. Tech. agron. Bonkoko. [For part 2, see *H.A.*, 29: 3068n.]

1445. Medina, D. M., and Conagin, C. H. T. M.
Auto-incompatibilidade em *Coffea dewevrei* de Wild. et Th. Dur. (**Self-sterility in *Coffea dewevrei*.)** [English summary ⅓ p.]
Bragantia, 1959, **18**: 283-93, bibl. 7.

Investigation showed that there is no abnormality in the pollen or embryo sac which could prevent fertilization, and the self-sterility is accordingly considered to be of genetic origin.

1446. Nogueira, P. (neto), Carvalho, A., and Antunes, H., Jr.
Efeito da exclusão dos insetos polinizadores na produção do café Bourbon. (**The effect of excluding pollinating insects on bourbon yield.**) [English summary 1½ pp.]
Bragantia, 1959, **18**: 441-68, bibl. 18, illus.

A 6-year trial on the self-fertile and almost completely autogamous bourbon variety showed that insects play only a secondary role in promoting pollination and increasing yields.

1447. Amaral, E.
Ação dos insetos na polinzação do cafeeiro Caturra. (**The role of insects in the pollination of caturra coffee.**) [English summary ¼ p.]
Rev. Agric. Piracicaba, 1960, **35**: 139-47, bibl. 3.

In a preliminary experiment with 44 coffee plants near an apiary, fruit set was 75·3% in exposed, and 61·7% in covered flowers.

Coffee—disorders, diseases and pests.

(*See also* 1652.)

1448. Accorsi, W. R.
Notas sôbre o comportamento do cafeeiro sob a ação da geada. (**Notes on the reaction of the coffee bush to frost.**)
Rev. Agric. Piracicaba, 1960, **35**: 25-32, bibl. 3.

The morphological and anatomical effects of frost on 4 varieties were studied at Campos do Jordão.

The former include chestnut brown discoloration of the leaf surfaces with spots and patches of darker brown. The chief anatomical symptoms are alterations of the epidermis, phloem, palisade tissue and spongy parenchyma.

1449. Ananth, K. C., and others.
Die-back of coffee—outlook and observations.
Indian Coffee, 1960, **24**: 238-45, bibl. 14.

A new form of die-back has been observed in Mysore during the past few years differing from the 5 types previously recognized and called the die-back complex. It has not been found possible to reproduce this form by inoculation with pathogens, and it seemed to be associated with thin or no shade and overcropping. Remedial measures include adequate mulching to preserve soil moisture, frequent applications of small dressings of N, K and P fertilizers, maintenance of foliage and pruning to avoid overcropping.—Coffee Res. Stat., Mysore State.

1450. George, K. V.
Stem-wasting "Kondlie" disease of coffee. Part I. Occurrence and symptoms.
Sheriff, M., Raj, T. R. N., and George, K. V.
Idem. II. Preliminary report on investigations.
Indian Coffee, 1959, **23**: 495-6, 502, illus., and 1960, **24**: 160-7, bibl. 1.

The experiments described in part 2 indicated that no pathogenic organism was responsible, and that spraying with bordeaux mixture was followed by a high incidence. Of the 3 arabica varieties tested Kents was the least susceptible. [See also *H.A.*, 30: 4452.]—Coffee Bd Res. Dep., Mysore.

1451. Barat, H., Dadant, R., and Baudin, P.
Le dépérissement du caféier d'Arabie sur les plateaux. **(The die-back of arabica coffee bushes on the plateaux.)**
Bull. Inst. Rech. agron. Madagascar, 1959, No. 3, pp. 81-3, illus.

The symptoms and losses caused by a die-back of coffee growing at high altitudes are described. A *Fusarium* sp. has been isolated, but inoculation has not reproduced the disease. Its prevention requires better growing conditions, including good soil, humus, windbreaks and shade.

1452. Dadant, R.
Le dépérissement parasitaire du *Coffea arabica* sur les hauts plateaux de Madagascar. **(Parasitic die-back of *Coffea arabica* on the high plateaux of Madagascar.)** [English and Spanish summaries 8 and 9 lines.]
Agron. trop., 1960, **15**: 213-30, bibl. 3, illus.

In the unsuitable climatic and environmental conditions existing at 800–1,700 m. above sea-level in Madagascar *C. arabica* suffers from a die-back, the symptoms of which are described. It is believed to be caused by *Fusarium lateritium*. It is considered that control can only be obtained by breeding resistant varieties.

1453. Swaminathan, B., Setty, H. T. R., and Parthasarathy, S.
Studies on "berry blotch" disease of coffee.
Indian Coffee, 1960, **24**: 246-50, bibl. 6, illus.

Of the arabica varieties tested Coorgs proved to be the most susceptible to *Cercospora* sp., and of the fungicidal sprays used 8:8:40 bordeaux was the most effective.

1454. Nutman, F. J., and Roberts, F. M.
Investigations on a disease of *Coffea arabica* caused by a form of *Colletotrichum coffeanum* Noack. I. Some factors affecting infection by the pathogen.
Trans. Brit. mycol. Soc., 1960, **43**: 489-505, bibl. 7, illus.

Flowers, very young fruit and ripe berries were the organs most susceptible to attack by berry disease. All parts of the plant may be attacked. Blue Mountain is the most resistant variety and the Harar varieties the most susceptible. Under optimal conditions infection can take place in as little as 2 hours.—Dep. Agric., Kenya.

1455. Rayner, R. W.
Rust disease of coffee. 1. Nature of the disease. 2. Spread of the disease. 3. Resistance.
World Crops, 1960, **12**: 187-90, 222-4, 261-4, bibl. 11, illus.

A detailed description of the life history and spread of *Hemileia vastatrix* is given. The existence of lines of *Coffea arabica*, *C. robusta*, *C. excelsa* and *C. liberica* fully resistant to all known races of the fungus is noted, and the use of these lines to produce varieties suitable for general distribution is discussed.—Commonw. mycol. Inst., Kew.

1456. Hanger, B. F., and Firman, I. D.
Resistant varieties of coffee in relation to physiologic races of *Hemileia vastatrix* in Kenya.
Kenya Coffee, 1960, **25**: 210-11, 219.

The S.12 Kaffa-type coffee of Ethiopian origin proved resistant to all races of rust except X, and the S.4 Agaro and S.6 Cioiccie varieties to all races including X. Among Indian selections 7 were resistant to races I and II, and Kents to races II and III. Two of the Kenya selections and 2 from Tanganyika were also resistant to races II and III.—Coffee Res. Stat., Ruiru, Kenya.

1457. Nutman, F. J., Roberts, F. M., and Bock, K. R.
Method of uredospore dispersal of the coffee leaf-rust fungus, *Hemileia vastatrix*.
Trans. Brit. mycol. Soc., 1960, **43**: 509-15, bibl. 7, illus.

Evidence is presented that rust epidemics result from spore dispersal by water-splash rather than by wind. Hence, control may be based on elimination of inoculum at a specific time, instead of prevention over a long period.—Dep. Agric., Kenya.

1458. Burdekin, D. A.
Wind and water dispersal of coffee leaf rust in Tanganyika.
Kenya Coffee, 1960, **25**: 212-13, 219, bibl 5, illus.

It is shown that *Hemileia vastatrix* is disseminated by wind as well as by water-splash, although the relative importance of each is not known. [For the water-splash-only theory, see *H.A.*, 30: 2891 and preceding abstract.]—Dep. Agric., Tanganyika.

1459. McKinlay, K. S., and Mesmer, E. T.
Low volume applications of copper fungicides to coffee.
Misc. Rep. colon. Pestic. Res. Unit **269**, [1960], pp. 7.

Three gallonage rates, viz, 7, 56 and 112 gal./acre and 3 concentrations, viz. 4, 8 and 12 g. Peronox per tree were tested. The results of physical assessments indicated that the 7-gal. level gave the best copper deposits, which, within the gallonage rates, were proportionate to the concentration. Results in terms of rust control are not reported.

1460. Franklin, W. W., and others.
Coffee insects of Liberia.
Stat. Notes centr. agric. Exp. Stat., Liberia, 1959, No. 16, pp. 1-28, bibl. 5, illus., from *Trop. Abstr.*, 1960, **15**, Abstr. h1800.

The most important insect pests of coffee in Liberia are the scale insects, the coffee stem-borer and the coffee bean-borer. Parathion effectively controlled the scale insects, while a locally prepared palm oil-soap emulsion gave fair control. The stem-borer was readily controlled by the use of an ethylene dichloride-carbon disulphide fumigant mixture; gasoline gave somewhat inferior control when injected and sealed in the tunnels. Good control of the coffee bean-borer was obtained by endrin in 3 applications at 2-week intervals as the green berries start ripening.

1461. Crowe, T. J., and Jones, G. D. G.
The control of antestia with pyrethrum.
Kenya Coffee, 1960, **25**: 214-15, illus.

Where infestation was below 20 per tree, a single application of 0·005% pyrethrum spray or 0·3% pyrethrum dust, plus a band of 5% DDT or 0·5% dieldrin on the lower part of the trunk to prevent reinfestation from the ground, proved effective. With heavier infestations, up to 80 per tree, 2 applications of spray and one of dust were required.—Coffee Serv. and Pyrethrum Bd, Kenya.

1462. McKinlay, K. S., Lee, C. W., and McKone, C. E.
A comparison of three mist blowers: the K.E.F. Motoblo, the Holder and the K.W.H. Whirlwind.
Misc. Rep. colon. Pestic. Res. Unit **267**, 1960, pp. 12.

The 3 hand-operated machines were tested for physical and mechanical efficiency and for the degree of control obtained over antestia and lace bug infestations on coffee. Against antestia the Holder proved the most effective. Lace bug populations were considerably reduced by all 3 machines.

1463. Godoi, C., Jr., and Graner, E. A.
O sombreamento dos cafèzais e a broca. (**Shading and borer infestation in coffee plantations.**)
Estado de S. Paulo, Supl. agríc., **237**, 1959, reprinted in *Bol. Super. Serv. Café, S. Paulo*, 1959, **34**(393): 18-19.

Over a 7-year period the average infestation of a shaded belt in a sloping coffee plantation was approximately twice as high as that in the sunny belt below and 4 times as high as in the sunny belt above.

1464. Stolp, H.
Über das Zusammenwirken von Bakterien und Insekten bei der Entstehung einer Geschmacksbeeinträchtigung des Kivu-Kaffees und die Rolle von Bakteriophagen bei der Aufklärung der Zusammenhänge. (**The combined activity of bacteria and insects in producing a deterioration of flavour in Kivu coffee, and the role of bacteriophages in the elucidation of the interaction.**) [English summary 1 p.]
Phytopath. Z., 1960, **39**: 1-15, bibl. 3.

Fruit flies (*Trirhithrum inscripta* and *Ceratitis annonae*) infesting coffee berries in the Kivu area are occasionally infected with *Xanthomonas* sp., which produces a disagreeable potato-like flavour in the beans. A few affected beans, indistinguishable except by taste from those unaffected, will spoil a considerable bulk of coffee. In one seriously affected plantation the defect was remedied by destroying the fruit flies.—Biol. Bundesanst. Land- u. Forstw., Berlin-Dahlem.

1465. Trigueros, L. F.
El minador de la hoja del cafeto. (**The coffee leaf-borer.**)
El Café El Salvador, 1959, **29**: 549-52, illus., from *Trop. Abstr.*, 1960, **15**, Abstr. h2089.

Dusting with a dieldrin 3%–folidol 2% mixture at 25–30 lb./7000 sq. m. has given good control.

1466. Crowe, T. J.
The leaf skeletonizer.
Kenya Coffee, 1960, **25**: 256-7, illus.

Control of *Leucoplema dohertyi* has been obtained with most insecticides; lead arsenate is recommended for general use, but malathion or pyrethrum should be used at picking time.

1467. Carayon, J.
Stethoconus frappai n. sp., miridé prédateur du tingidé du caféier, *Dulinius unicolor* (Sign.), à Madagascar. (***Stethoconus frappai* n. sp., a capsid predator of the coffee tingid *Dulinius unicolor* in Madagascar.**)
J. Agric. trop. Bot. appl., 1960, **7**: 110-20, bibl. 14, illus.

With suggestions on altering spray programmes to preserve the predator.

Coffee—harvesting and processing.

1468. Wang, J. K.
Time and motion studies of coffee picking in Kona.
Hawaii Fm Sci., 1960, **8**(4): 6-7, bibl. 2, illus.

Picking operations were studied with the aid of a ciné camera with a telescopic lens. Analysis of the results showed that a portable catcher placed below the tree and an electronic sorter might improve efficiency.

1469. Carvalho, A., Lopes, L., and Bottignon, A.
Máquina de beneficiar amostra de café. (**A machine for processing coffee samples.**)
Bol. Super. Serv. Café, S. Paulo, 1959, **34**(393): 5-8, illus.

The machine described will complete the 2 stages of parchment removal from 10 samples, each of 500 g., in an average time of 16·3 seconds. An attachment is available for collecting the parchment.

Guavas.

1470. Bowers, F. A. I., and Nakasone, H. Y.
Selection and naming of a new guava variety.
Hawaii Fm Sci., 1960, **8**(4): 1-2, bibl. 2, illus.

Various selections were compared with a standard for fruit size and cavity diameter, fruit weight, % seed, purée colour, flavour, pH, vitamin C content and % soluble solids. Selection B-30 was chosen by processors as the most promising because of its strong pink colour, acidity, freedom from off-flavours and small seed cavity indicating greater flesh content. It was named the J. H. Beaumont variety.

1471. Puttarudriah, M., and Channabasavanna, G. P.
A new mite pest of guava (*Psidium guajava*) in Mysore—*Brevipalpus* sp.
Lal-Baugh, 1959, **4**(4): 5-7, illus.

The control measures recommended are the burning of infected fruits, followed by drenching sprays of wettable sulphur or organo-phosphorus compounds, repeated every 2–3 weeks.

1472. Prista, L. N., and Alves, A. C.
Nota acerca dos taninos de *Psidium guayava* L. (**A note on the tannins of *Psidium guajava*.**) [English summary 4 lines.]
Garcia de Orta, 1959, **7**; 97-100, bibl. 18.

Data on the composition of guava leaves from San Tomé Island include figures for moisture, ash, lipids, carbohydrates, proteins, cellulose and 2 types of tannin. In some countries of the Far East the leaves are used medicinally. In San Tomé they are used both medicinally and for tanning.—Fac. Farm. Porto.

1473. Pruthi, J. S., Mookerji, K. K., and Lal, G.
Isolation, characterization and quantitative estimation of the chemical constituents of guava pectin.
Sci. and Cult., 1960, **26**: 34-5, bibl. 5.

The hydrolized pectin gave, on chromatographic analysis, d-galacturonic acid, d-galactose and l-arabinose, d-glucose being absent.—Cent. Food technol. Res. Inst., Mysore.

Mangoes.

(*See also* 1644.)

1474. Abbott, D. E., and Whelchel, H. C.
"Haden" and "mango" no longer synonymous.
Proc. 19th annu. Mtg Fla Mango Forum, 1959, pp. 28-30, illus.

The newer varieties Irwin, Zill, Sensation, Kent and Keitt equal or surpass Haden in production, shelf life, shipping qualities and taste. They mature at different times, thus lengthening the harvest season for mangoes. Bright coloured fruit are most desirable and mature fruit should be packed in shallow containers to avoid bruising.

1475. Serpa, D., and Figueroa, M.
Comentarios sobre algunas variedades del mango. (**Notes on some mango varieties.**)
Agric. venezol., 1960, **23**(216): 20-1, illus.

Notes are given on the performance in Venezuela of the varieties Keitt, Smith, Zill, Haden and Kent introduced from Florida in 1951.

1476. Agnihotri, B. N.
A note on production of flowers and fruits on rootstock stem of mango graft in the nursery.
Curr. Sci., 1960, **29**: 285, bibl. 2, illus.

On both scion and stock after inarching and before separation.

1477. Agarwala, S. C., Sharma, C. P., and Kumar, A.
The effect of the "black-tip" disease on the catalase and peroxidase activity of the mango fruit.
Curr. Sci., 1960, **29**: 195, bibl. 5.

Activity was increased in the apical (necrotic) part of the fruits of 3 varieties.

1478. Das-Gupta, S. N., and Sen, C.
Studies in the diseases of *Mangifera indica*. XI. The effect of boron on mango necrosis.
Phytopathology, 1960, **50**: 431-3, bibl. 26.

See *H.A.*, 29: 1912.

1479. Orian, G.
La mélanose de la mangue. (**Melanose of mangoes.**)
Rev. agric. sucr. Maurice, 1960, **39**: 128-30, bibl 2, illus.

Symptoms on fruits are described. The pathogen isolated from diseased stems was a *Phomopsis* sp., strongly resembling the conidial form of *Diaporthe citri*. This was associated with *Diplodia natalensis*. Fungicidal treatments are suggested.

1480. Campbell, C. W.
Storage and ripening of mangos.
Proc. 19th annu. Mtg Fla Mango Forum, 1959, pp. 11-12, illus.

The optimum temperature range for the ripening of mangoes is 65–75° F., since at temperatures above 80° F. quality is seriously impaired. Ripe fruit may be stored at 45° F., but hard fruit may not be stored at less than 50° F. At this temperature it can be stored for 3 weeks without softening compared with 2 weeks at 60° F. or 7–10 days at 70° F. Minimum weight loss occurs at 85–90% R.H.—Agric. Mktg Serv., U.S.D.A.

1481. Scarborough, E. F.
Mango marketing notes.
Proc. 19th annu. Mtg Fla Mango Forum, 1959, pp. 23-7.

Suitable growing conditions, varieties, yields, packing and marketing outlined.

Oil palms.

(*See also* 125, 1406, 1421, 1659.)

1482. Michaux, R.-M.-E., and others.
Les oléagineux dans la zone franc. (**Oil-producing plants in the franc area.**)
Oléagineux, 1960, **15**: 285-468, illus.

The whole of the May issue of this journal is devoted to a series of reviews on the cultivation and utilization of oil-bearing plants in French or former French territories. Although concerned mainly with the oil palm, other crops, including olives, coconuts, castor beans, *Butyrospermum parkii*, *Balanites aegyptiaca* and tung, are discussed.

1483. Devreux, M., and Malingraux, C.
Pollen de *Elaeis guineensis* Jacq. Recherches sur les méthodes de conservation. (**Studies on methods of preserving pollen of *Elaeis guineensis*.**) [Flemish summary 1 p.]
Bull. agric. Congo belge, 1960, **51**: 543-66, bibl. 5, illus.

The most effective method of preserving the viability of oil palm pollen was found to be drying in a desiccator over calcium chloride or, preferably, silica gel to a moisture content of about 15%. Pollen so treated and then sealed in test tubes retained adequate viability for a year.

1484. Moens, P., and Fraselle, J. V.
Étude expérimentale de la cercosporiose du palmier elaeis. Essai factoriel d'inoculation sur jeunes plants de pépinière. (**Experiments on leaf spot of oil palms. A factorial trial of inoculation of young nursery plants.**)
Oléagineux, 1960, **15**: 609-17, bibl. 16, illus.

Young oil palms in the nursery were inoculated with *Cercospora elaeidis* after being subjected to different levels of nutrients and water supply. The most susceptible plants were those given an unfavourable water regime, nutrient level having little effect.—I.N.É.A.C., Yangambi.

1485. Coursey, D. G.
Importance des microorganismes dans la lipolyse de l'huile de palme au cours du stockage. (**The significance of micro-organisms in the lipolysis of palm oil during storage.**)
Oléagineux, 1960, **15**: 623-30, bibl. 24.

From the experiments described it is concluded that lipolysis is entirely a hydrolytic process, which, in the absence of micro-organisms, proceeds slowly in the presence of water but is of little importance at temperatures usually prevalent in Nigeria. When micro-organisms are present, the rate of deterioration largely depends on the amount of water present in the oil.—W. Afr. Stored Prod. Res. Unit, Port Harcourt.

Papaws.

1486. Kebby, R. G.
Papaw culture.
Agric. Gaz. N.S.W., 1960, **71**: 169-74, illus.

Pistillate, staminate and bisexual types of tree are described, together with methods of propagation, cultivation and fertilization.

1487. Alekseev, V. P.
Papaw, *Carica papaya*. [Russian.]
Subtrop. Kul'tury, 1959, No. 2, pp. 74-80, bibl. 15, illus.

The literature is reviewed, and it is concluded that the early Florida variety Betty might be grown in the U.S.S.R.

1488. Hiyane, J., and Hamilton, R. A.
Comparison of flavour and sweetness of papayas from female and hermaphrodite plants.
Hawaii Fm Sci., 1960, **8**(4): 5, 8, illus.

Results of fruit quality and sweetness tests showed that flavour and sweetness of fruits do not depend on the sex of the plants from which they are harvested. The round female fruits are suitable for both processing and dessert purposes.

1489. LANGE, A. H.
The effect of fumigation on the papaya replant problem in two Hawaiian soils.
Proc. Amer. Soc. hort. Sci., 1960, **75**: 305-12, bibl. 11.

The effectiveness of corrective measures on soils associated with "replanting" of papaws appeared to vary with location and soil type. In well-drained soils, where nematodes were apparently the principal causal agents of declining papaw growth, Nemagon at 35 to 70 lb. per acre consistently gave the greatest long-term growth response and produced the largest yields. DD at 200 lb. per acre and methyl bromide at 182 lb. per acre reduced the population of *Rotylenchulus reniformis* and gave satisfactory growth of Solo papaw plants. On poorly drained soils, where root-rotting fungi may have been more detrimental than nematodes, Nemagon at 140 lb. per acre and DD at 400 lb. per acre were ineffective; but 91 and 182 lb. per acre of methyl bromide, 250 lb. per acre of chloropicrin and 440 lb. per acre of Vapam resulted in increased plant growth. [From author's conclusions and summary.]—Hawaii agric. Exp. Stat., Honolulu.

1490. SHERMAN, M., AND TAMASHIRO, M.
Toxicity of insecticides and acaricides to the papaya, *Carica papaya* L.
Tech. Bull. Hawaii agric. Exp. Stat. **40**, 1959, pp. 56, bibl. 24, illus., from *Trop. Abstr.*, 1960, **15**, Abstr. h1834.

Phytotoxicity was measured on seedling growth, gross leaf pathology and fruit injury. Emulsifiable formulations were usually more phytotoxic than wettable powders. Most organic phosphates, except malathion, were highly toxic. The fruits were more sensitive to the organic acaricides and to the emulsifiable formulations of the chlorinated hydrocarbons than were the seedlings. The fruits, however, were more resistant than the seedlings to organic phosphates. The effect of combining certain pesticides was also studied.

1491. AKAMINE, E. K.
Temperature effects in fresh papayas processed for shipment.
Bull. Hawaii agric. Exp. Stat. **122**, 1960, pp. 14, bibl. 3.

In the hot water treatment of papaws temperatures in excess of 116° F. proved detrimental when followed by fumigation with 1½ lb. EDB per 1,000 cu. ft., even when the fruit was cooled to below 90° F. before fumigation. It is recommended that either a constant temperature of 116° F. be maintained during the hot water treatment or the water temperature be raised to 120° F., the source of heat removed and the fruit immersed for the 20 min. required. Cardboard dividers with quilt-like packing are to be preferred to shredded paper packing to ensure quick cooling and good insulation.

1492. KRISHNAMURTHY, G. V., AND OTHERS.
Pilot-plant studies on the preparation of crude papain from raw papaya.
J. Sci. Food Agric., 1960, **11**: 433-6, bibl. 7.

Six separate tappings were made from a third-year crop at about 3 months after setting. Latex yield was highest in tapping 1 and lowest in tappings 4–6, varying from 0·54 to 1·57%, with an average of 0·94%. Yield of crude papain was highest in the first 2 tappings and gradually decreased, varying from 0·15 to 0·47 and averaging 0·28%. The total solids content of the latex was highest in the second, and lowest in the first, tapping, varying from 11·1 to 54·9%. The milk clotting activity of the crude papain was highest in the first 2 tappings. The addition of 0·5% metabisulphite improved the papain if sun-dried but not if vacuum-dried. The addition of thymol made no further improvement. —Cent. Food tech. Res. Inst., Mysore.

Pineapples.

1493. KAY, D. E., AND SMITH, E. H. G.
The production and world trade in fresh pineapples.
Trop. Sci., 1960, **2**: 55-63, bibl. 3.

Output of pineapples in the principal producing countries, exports and imports tabulated.

1494. PY, C.
Le stockage des rejets d'ananas en saison sèche. (**The storage of pineapple suckers during the dry season.**)
Fruits d'Outre Mer, 1960, **15**: 29-32.

Trials and observations at the fruit research centre in Guinea have shown that pineapple suckers can be stored successfully for 6 months and that success depends more on the quality of the suckers than the length of storage. It seems desirable therefore to take and store suckers early, say in December, rather than later, thereby avoiding any ill effects of the dry season. Suckers should be stored upright and in the shade. General practice is also to disinfect before storing by plunging the suckers into a solution of 0·02% parathion.

1495. WANG, H., AND CHANG, S. M.
An experiment on close planting of pineapples (II). [Chinese, with English summary ⅔ p.]
Publ. Taiwan agric. Res. Inst., 1959, pp. 8, bibl. 8.

Plant populations of 25,000 30,000, 35,000, and 40,000 per hectare were established at 15 different places. The effect of spacing was most marked in the ratoon crop, in which the percentage of plants fruiting fell from 92·8 in the widest spacing to 66·3 in the narrowest, and in which the average yield per hectare rose from 35·24 tons to 40·31 tons for these spacings. Density of planting had no influence on average fruit weight or grading.

[For part I, see *H.A.*, 29: 4068.]—Fengshan trop. hort. Exp. Stat.

1496. Aldridge, N. L.
Crookneck in pineapples is not hard to control.
Qd agric. J., 1960, **86**: 97-8, illus.

Symptoms of the disease, which is due to a deficiency of Zn and Cu in the soil, are described. Control may be obtained by applying a mixture containing equal quantities of Cu and Zn sulphates at 50 lb. per 1,000 plants.

1497. Cannon, R. C.
Spraying weeds in pineapples.
Qd agric. J., 1960, **86**: 181-4, illus.

Pre-emergence spraying is recommended with either PCP or CMU. For contact spraying when grasses are troublesome PCP with diesel oil or creosote has proved efficacious. Where patches of couch or kikuyu grasses are present TCA or dalapon, both injurious to pineapples, can be used with caution, but it is advisable to use these latter herbicides to obtain complete weed eradication before planting.

1498. Young, H. Y.
Colorimetric microdetermination of 1-chloro-2-nitrobenzene in pineapple.
J. agric. Food Chem., 1960, **8**: 213-14, bibl. 3.

The herbicide ONCB is extracted and determined by measuring the intensity of the azo dye formed after reduction, diazotization, and coupling with *N*-(1-naphthyl)-ethylenediamine. This sensitive micro-method can determine 0·01 p.p.m. of the herbicide in pineapples.—Pineapple Res. Inst., Honolulu, Hawaii.

1499. Gowing, D. P., and Leeper, R. W.
Studies on the relation of chemical structure to plant growth-regulator activity in the pineapple plant. I. Substituted phenyl and phenoxyalkylcarboxylic acids.
Bot. Gaz., 1960, **121**: 143-51, bibl. 24.

Results are given of testing 202 substances for flower induction, inhibition and phytotoxicity. Several phenoxyacetic and other phenoxy acids induced flowering, and their chemical characteristics are described. Phenylacetic and β-phenylpropionic acids were inactive.—Pineapple Res. Inst. Hawaii.

1500. Colbran, R. C.
Nematode control in pineapples.
Qd agric. J., 1960, **86**: 386-8, illus.

Symptoms of nematode infestation are described. Control is obtained by pre-planting treatment of the soil with EDB (27% w/v or 12½ v/v) or DD (25 or 17 gal./acre for overall or bed treatments, respectively). The fumigant is applied in rows 1 ft. apart at a depth of 6–9 in. in well prepared moist soil, which should be rolled immediately after treatment. Nemagon (2 gal./acre) may be used to obtain control with established plants less than 8 months old.

1501. Bruce, D. W.
Serotonin in pineapple.
Nature, 1960, **188**: 147, bibl. 6.

Values of 23 and 25 mg./l. in canned, and 12 mg./l. in fresh, juice found at Univ. Melbourne.

Rubber trees.

1502. Rubber Research Institute of Malaya.
The Rubber Research Institute of Malaya.
[*Publ.*] *Rubb. Res. Inst. Malaya*, 1960, pp. 17, illus., 50 cts.

A brochure describing the research and advisory work of the Institute, with an introductory note on the early history of rubber research in Malaya.

1503. Bouharmont, J.
Recherches taxonomiques et caryologiques chez quelques espèces du genre *Hevea*. **(Taxonomic and chromosome studies on certain species of the genus *Hevea*.)**
Publ. Sér. sci. Inst. nat. Ét. agron. Congo belge **85**, 1960, pp. 64, bibl. 44, illus.

Hevea guianensis, *H. collina*, *H. benthamiana*, *H. brasiliensis* and *H. spruceana*.

1504. Mendes, L. O. T.
A multiplicação da seringueira (*Hevea brasiliensis* Muell.-Arg.) por meio de estacas. **(Multiplication of hevea by cuttings.)** [English summary ¾ p.]
Bragantia, 1959, **18**: 245-74, bibl. 1, illus.

Ring-barking by encircling the stem with thin wire encouraged good rooting when the cuttings were severed just below the callus and placed in sand, the resulting plants ultimately producing 1–3 stout tap roots. Better results were obtained with ringing just below a leaf or pair of leaves than just below a bud (92 and 84% rooting, respectively, in one trial), with ringing for 40 days than with ringing for longer or shorter periods before severing, with leafless than with leafy cuttings and with younger basket plants than with 10-month-old field plants. More than one cutting could be obtained from each plant.

1505. Mendes, L. O. T.
Sôbre o enraizamento de estacas de seringueira. **(The rooting of hevea cuttings.)** [English summary 8 lines.]
Bragantia, 1959, **18**: xlvii-xlix, bibl. 5.

The results obtained by banding with wire [see previous abstract] are compared with those obtained by other authors on material of different age and origin without banding. The facts that the basal portions of shoots root more readily than the medial or apical portions and that rooting is promoted by banding both suggest the downward transference of a root-inducing growth substance in hevea cuttings.

1506. Mendes, L. O. T.
Considerações sôbre a enxertia da seringueira. (**Observations on the budding of hevea.**) [English summary 8 lines.]
Bragantia, 1959, **18**: 141-59, bibl. 1.

The results of numerous trials with 4 methods of shield budding, carried out in northern Brazil between late February and early April, showed that "lateral window" budding (with the stock rind flap opening sideways like a door) was more successful than the T incision, the inverted T, a "window" opening from below or a simple vertical incision. The poorest results were given by leaving the woody tissue on the bud chip and using the inverted T incision. The afternoon was the best time for budding. It was advantageous to allow the latex to coagulate on the stock incisions before inserting the scion and also to apply the protection of a hevea leaf tied round the stock over the usual waxed bands. Approach grafting on *Hevea spruceana* rootstocks gave an average take of 75%.

1507. Mendes, L. O. T.
Observações sobre a produtividade de seringueiras (*Hevea brasiliensis* Muell.-Arg.) plantadas de sementes. (**Observations on the productivity of seedling rubber.**) [English summary ½ p.]
Bragantia, 1959, **18**: 417-40, bibl. 1.

In a trial with 31 seedlings, approximately 33 years old, in which an alternate-day, half-spiral tapping system was used, there was great variation in yield, the best tree giving 12·07 and the worst 0·78% of the total yield; about 10% of the population gave about 25% of the total yield and about 25% gave about 50% of the yield. It was concluded that unselected seedlings can be used for commercial planting since they can be planted at a very high density and heavily thinned to eliminate the low-yielding material, which will reveal itself after a few weeks' tapping.

1508. de Silva, C. A.
The performance of "exchange" clones imported into Ceylon.
Quart. J. Rubb. Res. Inst. Ceylon, 1960, **36**: 1-16.

Yield and growth data on 80 imported clones from Malaya, Sumatra, Java and Indo-China are summarized and recommendations made for further trials.

1509. Anon.
Soil reaction and rubber cultivation.
Plant. Bull. R.R.I.M., 1960, No. 50, pp. 98-103, illus.

Hevea prefers the more acid soils, as higher pH values limit the supply of iron and the availability of rock phosphate. To avoid loss of K and Mg, however, urea is preferred to sulphate of ammonia as a source of nitrogen.

1510. Hasselo, H. N.
Fertilizing of young rubber in the Cameroons.
Neth. J. agric. Sci., 1960, **8**: 165-78, bibl. 13.

The girth increases of rubber trees treated with combinations of N, P and K were measured. Lack of rooting depth was found to have far more effect on growth than nutrient supply, shallow rooting reducing the non-productive period by one year, whereas abundant nutrients only shortened it by six months. N and K appeared to be the main requirements, P being effective only in combination with the other two. Possible means of obtaining further yield increases by applications of N, P and K are discussed in relation to seasonal fluctuations. —Cameroons Dev. Corp., Ekona.

1511. Anon.
An experiment with magnesium limestone.
Plant. Bull. R.R.I.M., 1960, No. 50, pp. 103-5.

On a soil in which hevea showed symptoms of Mg deficiency the application of 2–3 lb. of magnesium limestone per tree gave marked increases in growth and a 14% greater yield.

1512. Wycherley, P. R.
Vegetation of rubber plantations.
J. Rubb. Res. Inst. Malaya, 1960, **16**: 87-92, bibl. 4.

The results of surveys of the ground cover vegetation in rubber estates are reviewed. There are indications that prolonged hevea cultivation with modern upkeep methods has impoverished the flora and led to the predominance in the vegetation of types believed to be less beneficial than the displaced species to the growth of hevea. [Author's abstract.]

1513. Saccas, A. M.
Une grave maladie des hévéas des terres rouges en Oubangui-Chari. (**A serious disease of hevea on the red soils of Oubangui-Chari.**) [English and Spanish summaries ½ p. each.]
Agron. trop., Paris, 1959, **14**: 409-58, bibl. 76, illus.

The 2 fungi *Colletotrichum heveae* and *Gloeosporium albo-rubrum*, generally regarded as the pathogens of anthracnose in hevea, are here considered to be identical, and the name *C. gloeosporioides* f. *heveae* is proposed. Experiments with 11 fungicides led to the recommendation of 3 preventive applications of either ziram or ferbam, at 2·5 kg./ha. for atomization or 0·25% for spraying, at the first appearance of new leaves and again 10 and 30 days later.

1514. Rubber Research Institute of Ceylon.
A severe case of pink disease.
Quart. J. Rubb. Res. Inst. Ceylon, 1960, **36**: 29-30, illus.

Clone PB 86, which was reputed not be to susceptible, has been severely affected. Recommended control measures are spraying trees not in tapping with a proprietary copper fungicide and those in tapping with Fylomac 90. Antimucin, Ceresan, Panogen and Verdasan show promise.

1515. Viégas, A. P.
A cinza do pinhão paraguaio. (**Mildew of *Jatropha curcas*.**) [English summary 5 lines.]
Bragantia, 1959, **18**: v-xii, bibl. 4, illus.

The eradication of trees of *Jatropha curcas* from the vicinity of hevea plantations might materially help n controlling the mildew fungus *Oidium heveae*, of which both species are hosts, but *J. curcas* is commonly used in São Paulo for hedges, and complete eradication would be difficult. The selection of naturally immune hevea strains is advocated.

1516. Evers, E.
La stimulation de l'hévéa. (**Hevea stimulation.**)
Bull. Inf. I.N.É.A.C., 1960, **9**: 139-48, bibl. 5.

The use and abuse of stimulants such as petroleum, copper sulphate, sodium arsenite, 2,4-D and 2,4,5-T for increasing the yield of latex are discussed. Methods of application, dosages and frequency are detailed, and an account is given of possible subsequent plant injury.

1517. Archer, B. L.
The proteins of *Hevea brasiliensis* latex. 4. Isolation and characterization of crystalline hevein.
Biochem. J., 1960, **75**: 236-40, bibl. 19, illus.

A protein containing 5% of sulphur and 15 amino acids including cystine, with a M.W. of approx. 10,000.

1518. Southorn, W. A.
Complex particles in *Hevea* latex.
Nature, 1960, **188**: 165-6, bibl. 7, illus.

Description and electron micrographs of particles forming the bulk of Moirs' zone 8 [see *H.A.*, 30: 1329].

Sugar cane—general.

(*See also* 155.)

1519. de Ullivarri, R. F., and Guerineau, C. M.
Zonas para la futura expansión azucarera argentina. (**Zones for future expansion of sugar cane growing in Argentina.**)
Idia, 1960, No. 146, pp. 11-47, bibl. 3, illus.

In Tucumán there are no further areas suitable for cane, but production could be increased by using selected varieties, especially early frost-tolerant varieties in districts liable to hail, by adequate and timely cultivation and by N fertilization at 60 kg. per ha. Other parts of Argentina suitable for irrigated and unirrigated cane are described.

1520. Sen, S. C.
Sugarcane in Bihar.
Indian Sugar, 1960, **10**: 275-8, 291-2, bibl. 15.

Records of acreage and recovery % cane with suggestions for crop improvement.

1521. The Sugar Manufacturers' Association of Jamaica.
Annual Report of the Research Department, 1958, Mandeville, [1960], pp. 102.

Cultural and miscellaneous studies: Rows spaced 4 ft. apart proved the most productive for the plant cane crop, but 5-ft. spacing was best for the 1st and 2nd ratoons. Irrigating alternate furrows saved much water but reduced yields. The use of cattle carts for infield transport lowered yields by only 1·5%, whereas with tractors the loss was 8%. *Nutrition:* Sulphate of ammonia was slightly more effective as a source of N than urea. Applications of 10 tons of filter press mud or 5 tons of fortified filter press mud per acre were equal to 4 cwt. of triple superphosphate plus 3 cwt of sulphate of ammonia. *Varieties:* In the final-stage trials the 3 leading varieties were B.51410, B.51414 and B.51415. *Diseases and pests:* B.41227 was less severely affected by nematodes than B.4362. BHC, dieldrin and chlordane were slightly beneficial, but the most effective fumigant was DD. In a trial to test the susceptibility of 23 varieties to ratoon stunting disease the yield of B.51414 was reduced the most, namely by 27·80%. In the same experiment 11 varieties gave reduced yields after receiving heat treatment.

1522. Smith, C. E. M.
Variety situation for 1958.
J. Jamaican Ass. Sugar Tech., 1958, **21**: 23-5.

B.41227 and B.4362 the leading varieties in Jamaica in 1958.

1523. Young, H. E.
Varietal trials—1959 season.
Cane Grs' quart. Bull., 1960, **24**: 32-6.

At 10 places in Queensland.

1524. Mourguet, H.
La station de sélection de la canne à sucre de la Réunion. (**The sugar cane selection station on Réunion island.**)
J. Agric. trop. Bot. appl., 1959, **6**: 637-52, bibl. 2, illus.

History, organization, technique and notes on new varieties.

1525. Steward, E.
Some notes on mechanization in the Natal (S.A.) sugar industry.
J. Jamaican Ass. Sugar Tech., 1958, **21**: 18-20, illus.

Descriptions of 2 types of planting machine, a self-loading trailer and a crawler tractor cane loader.

1526. Sreenivasan, P. S.
A complete harvest experiment on sugarcane for the estimation of yield by sampling.
Indian J. Sugarcane Res., 1960, **4**: 117-27, bibl. 16.

The distribution of yields from 2 ft. lengths and 4 ft. lengths of rows was worked out and the most efficient sample size found to be a linear 8 ft. length of row. The most suitable stratification of plots for sampling was sub-division into 2 equal sub-plots along the row.—[See also *H.A.*, 29: 4088.]—Agric. Met. Div., Poona.

Sugar cane—planting, growth and weed control.

1527. Mukherjee, K. L.
Experiments for increasing the germination percentage of sugarcane.
Indian J. Sugarcane Res., 1960, **4**: 155-9, bibl. 18.

Several experiments are described, which indicated: (1) that middle buds germinated more slowly but with a higher percentage than top buds, (2) steeping the setts in water at 35° C. for 10 minutes apparently increased germination, (3) partial drying in the sun for 2 hours delayed germination but also increased the percentage, and (4) among various pre-planting treatments tested soaking the setts in well water for 24 hours, dipping in lime water for 10 minutes, and dipping in Knop's nutrient solution for 24 hours all increased germination percentage.—Banaras Hindu Univ., Varanasi-5.

1528. Edmond, J. T.
Modifications to a furrow plough for the planting of cane.
J. Jamaican Ass. Sugar Tech., 1958, **21**: 20-2, illus.

A planter unit is described, which is attached behind the double furrow plough and can plant over an acre per hour.

1529. Rao, G. N., Rao, N. V. M., and Rao, P. H.
A preliminary note on the effect of gibberellic acid on growth and tillering of sugarcane.
Indian J. Sugarcane Res., 1960, **4**: 144-8, bibl. 3.

Gibberellic acid was applied to young Co.419 plants growing in pots, together with various levels of N and P_2O_5. Application of GA resulted in significant elongation of the stalk, but tiller production was significantly depressed. The elongation of the stalk decreased as the N level was increased, but tillering increased. Phosphoric acid did not affect either elongation or tillering.—Sugarcane Res. Stat., Anakapalle, A.P.

1530. Ranganathan, V.
Preliminary studies on pithiness of sugarcane.
Madras agric. J., 1960, **47**: 66-70, bibl. 13.

The percentage volume of pith increased with manurial dressing. Pithiness was associated with increases in the percentage of fibre and a steep decline in sheath moisture.

1531. Adhate, S.
The best ratoon.
Indian J. Sugarcane Res., 1960, **4**: 137-43, bibl. 14.

A review of evidence on the value of ratooning.

1532. Hanson, N. S.
Weed control in Hawaii—half million acres to spray.
La Sugar J., reprinted in *S. Afr. Sugar J.*, 1960, **44**: 21-5, illus.

The development of chemical weed control in the Hawaiian sugar cane plantations since 1913 is outlined. From 1947 to 1952 various forms of 2,4-D were used for pre-emergence weed control, but CMU and DCMU (3-4 lb./acre) have been used since 1952. The introduction of CMU doubled the period of pre-emergence control which could be obtained with an equivalent weight of 2,4-D. DCMU was slightly more effective than CMU and less phytotoxic. A combination of 2,4-D with dalapon, TCA, activated oil emulsions or straight oil has been used to supplement the action of CMU or DCMU. For the destruction of the more persistent grasses a 1 : 3 combination of dalapon and TCA is most commonly used, and it is recommended that 5% CADE be added to the mixture, with or without 2,4-D. The herbicides are applied by aircraft, tractors and by hand. The most common weed species are listed, and changes in the dominant species due to the use of herbicides are described.—H.S.P.A. Exp. Stat.

1533. Rehbein, C. A., and Bates, G.
A review of chemical weed control in North Queensland canefields.
Cane Grs' quart. Bull., 1960, **24**: 27-9.

1534. Muthuswamy, R.
Control of *Croton sparsiflorus* Mor. in sugarcane fields by chemical method.
Indian Sugar, 1960, **9**: 691-7, bibl. 3, illus.

Pre-emergence sprays of Trioxone (2,4,5-T) at 3 pt./acre and Agroxone (MCPA) at 7 pt./acre reduced the weed population, and post-emergence treatment with Trioxone gave complete control, comparing favourably with mechanical weeding.—Begg, Sutherland & Co. Ltd, Marhowrah.

1535. Rehbein, C. A.
Prickly cucumber control.
Cane Grs' quart. Bull., 1960, **24**: 10-12, illus.

Of the herbicides tested for the control of *Cucumis metuliferus* in sugar cane 2,4,5-T 80% at ½ pint per acre was as effective as Amitrol at 1½ lb. per acre and only half the cost.

Sugar cane—climatic factors and irrigation.

(*See also* 1647.)

1536. Khanna, K. L.
Unprecedented heat wave during April-June period in Bihar and its attendant consequences.
Indian J. Sugarcane Res., 1960, **4**: 176-7.

Data on crop losses were obtained from a questionnaire after a summer when temperatures reached 114–119° F. for 2–5 weeks. The highest losses amounted to 50% and the average was 15%.—Sugarcane Res. Inst., Pusa, Bihar.

1537. Lakshmikantham, M., and Rao, K. K. P.
Preliminary studies on the influence of shade, with particular reference to age of crop, on cane juice quality.
Indian J. Sugarcane Res., 1960, **4**: 184-5, bibl. 7.

Results indicate that shading has an adverse effect on the sucrose content of juices, this being most marked in older crops and in heavily manured plants (200 lb. N/acre.)—Sugarcane Res. Stat., Anakapalle, A. P.

1538. Asana, R. D.
Investigations on water relations of some Indian crop plants—a review.
Bull. Res. Coun. Israel, Sect. D, 1960, **8D**: 97-104, bibl. 39.

Including a brief review on water requirements and drought resistance in sugar cane.

1539. Swan, A. D.
The years of reputed drought.
Rev. agric. sucr. Maurice, 1960, **39**: 151-4.

Between 1877 and 1937 nine years in Mauritius were considered to be drought years. Sugar cane crop losses attributed to drought averaged 14% for the drought years or 2% per annum over the whole period.

1540. Walker, B.
The effect of soil type and soil moisture content on growth of sugar-cane in the east coast area of Demerara.
Trop. Agriculture Trin., 1960, **37**: 227-33, bibl. 9.

The rate of growth was found to be closely correlated with the availability of moisture. This figure may be calculated from measurements of field capacity and permanent wilting points and used to determine irrigation requirements.—Bookers' Sugar Est. Ltd., Brit. Guiana.

1541. Cornelison, A. H., and Humbert, R. P.
Irrigation interval control in the Hawaiian sugar industry.
Hawaii. Plant. Rec., 1960, **55**: 331-43, bibl. 13, illus.

Both Bouyoucos blocks and irrometer-tensiometers gave adequate irrigation frequency estimates on a commercial scale.

Sugar cane—nutrition.

(*See also* 1647, 1671.)

1542. Humbert, R. P.
A survey of plantation practices.
Hawaii. Plant. Rec., 1960, **55**: 285-91, bibl. 8.

Increased fertilizer applications have raised the sugar yield in Hawaii by two tons per acre.

1543. Humbert, R. P.
Fertilization by aircraft in the Hawaiian sugar industry.
Hawaii. Plant. Rec. 1960, **55**: 301-11, bibl. 16, illus.

Part of the N and K requirements have been supplied as foliar sprays, as late first season and early second season supplements. The low solubility of muriate of potash, however, has led to the adoption of granular fertilizers. Application of K by air is particularly effective where a Ca : K antagonism produces K deficiency. Aerial application of supplementary fertilizer has given an average increase of 0·9 tons of sugar per acre.

1544. Bieske, G. C.
Aerial fertilizing—some distribution patterns.
Cane Grs' quart. Bull., 1960, **24**: 4-6.

Tests of aerial distribution patterns plus visual observations of subsequent cane growth indicated uneven application and the need for modifications to the aircraft distributor.

1545. Iyer, S. S., and Tandon, R. K.
A review of sugarcane manurial trials in Uttar Pradesh.
Indian J. Sugarcane Res., 1960, **4**: 160-5, bibl. 24.

Phosphate and potash did not produce any effect when applied directly to sugar cane, but phosphate (100 lb. P_2O_5/acre) applied to legumes resulted in 5–10% increases in the cane crop following the legumes. Repeated applications of sulphate of ammonia resulted in progressive deterioration of cane yields unless accompanied by green manuring. The most suitable combination was organic manure (green manure plus FYM or press mud) to give 80 lb. N/acre, and light organic (oil cakes) and inorganic fertilizers (ammonium sulphate) to give 40 lb. N/acre. The best times for application were: organic manures 1½–2 months before planting, oil cakes 1 month before planting, and inorganic fertilizers at planting time or soon after germination.—Sugarcane Res. Stat., Shahjahanpur, U.P.

1546. Ewart, G. Y., and Humbert, R. P.
Use of mill waste organic matter in improving Hawaiian sugar cane soils.
Hawaii. Plant. Rec., 1960, **55**: 319-29, bibl. 6, illus.

Increased yields up to 3 tons/acre resulted from the incorporation of 15–30 tons/acre of trash or bagasse into heavy clay soils, after it had been heaped for 6 months in wetter, and for 18–24 months in drier, districts. The cost is estimated at $30–$40/acre.

1547. Cleasby, T. G.
Use of molasses on the land. A report of four experiments being carried out by the Tongaat Sugar Company Ltd.
Proc. 33rd annu. Congr. S. Afr. Sugar Tech., 1959, pp. 95-9, bibl. 2, illus.

In the 1st and earliest experiment an application of 800 gal. per acre of molasses to the plant crop and of 1,000 gal. per acre to the 1st ratoon gave increases of 10·1 tons and 7·3 tons per acre, respectively, with a residual effect from the first application of 3·8 tons per acre. In the 3 succeeding experiments responses to 2,000, 3,000 and 4,000 gal, per acre on the plant crop were progressively greater than the response to 1,000 gal. per acre, but as they did not cover the extra cost the 1,000-gal. rate is recommended.

1548. Gill, P. S., and Singh, H.
A note on the effect of mahua cake on the chemical properties of soil and yield and quality of sugarcane.
Indian J. Sugarcane Res., 1960, **4**: 181-2, bibl. 4.

An application of cake made from *Bassia latifolia* seed (at 100 lb. N/acre) resulted in slight increases in nitrate N, total N and organic C in the soil and an increase in cane yield and juice quality, which was superior to that obtained following the application of groundnut cake.—Sugarcane Res. Stat., Jullundur, Punjab.

1549. Lintner, J.
Results of a fertilizer trial on very shallow soil.
Proc. 33rd annu. Congr. S. Afr. Sugar Tech., 1959, pp. 109-11.

The experiment was factorial with N at O, 125 and 250 lb. per acre, P_2O_5 at O, 100 and 200 lb. per acre and K_2O at 0, 150 and 300 lb. per acre, using varieties N:Co.310, 293 and 339. Significant responses were obtained from the 2 N levels and the lower K level. N:Co.339 gave a significantly higher cane yield but a lower sugar percentage than the other varieties. There was a significant interaction between K and variety in the purity percentages.

1550. Raheja, P. C., and Misra, K. P.
Cultural experiment to investigate the interrelationship amongst the factors of depth of ploughing, time of application of nitrogen and placement of phosphate.
Indian J. Sugarcane Res., 1960, **4**: 128-36, bibl. 31.

Co. 312 was planted after the land had been prepared in 3 different ways, with the application of 100 lb. N at planting time or ½ at planting and ½ at earthing-up, and with the application of superphosphate by broadcasting or by placement in the bottom of the furrows. Deep preparatory tillage did not benefit the crop; applying N in one full dose resulted in high sucrose and purity; and furrow placement of P slightly increased the sucrose content.—Indian agric. Res. Inst., New Delhi.

1551. Parish, D. H., and Feillafé, S. M.
A comparison of urea with ammonium sulphate as a nitrogen source for sugar-cane.
Trop. Agriculture Trin., 1960, **37**: 223-5, bibl. 8.

Experiments are described which showed that urea was less effective than ammonium sulphate both as regards yield and foliar content of N. Possible reasons for this are: the nutrient value of the S in the latter, biuret toxicity of urea, conversion to ammonium cyanate which is toxic, leaching loss through conversion to ammonium carbonate, leaching loss through high nitrification rate and loss through volatilization of the ammonia formed. [See also *H.A.*, 30: 4529.]—Sugar Ind. Res. Inst., Réduit.

1552. Thompson, H. M.
Comparison of urea and sulphate of ammonia as sources of nitrogen in agriculture.
J. Jamaican Ass. Sugar Tech., 1958, **21**: 15-17, bibl. 5.

Both fertilizers lowered soil pH, although sulphate of ammonia was more active in this respect. Both supplied the same amount of N when applied at equivalent rates to plant and ratoon cane, but sulphate of ammonia gave slightly higher yields.

1553. Aughtry, J. D.
The response of ratoon cane to nitrogen as influenced by climate and age of cane.
J. Jamaican Ass. Sugar Tech., 1958, **21**: 8-15.

The comparative performances were measured of ratoon crops with growing periods of 12½ months starting at 5 different dates between 15 January and 15 July, with and without N fertilization. Results showed that the date at which the preceding crop was harvested greatly influences the yield and sugar content and also affects the time at which the fertilizer should be applied. Crop logging data are presented in detail.

1554. Anderson, J. R.
Some observations on microbial activities in two sugarcane soil groups.
Proc. 33rd annu. Congr. S. Afr. Sugar Tech., 1959, pp. 114-28, bibl. 9, illus.

Nitrification and denitrification studied in a red doleritic and a recent grey sandy soil.

1555. SEN, S. C., AND BHARGAVA, J. C.
Studies on the formulation of manurial schedule of sugarcane crop in respect to phosphate absorption through foliage analysis. Part I. Determination of the particulars of the leaf to be considered for the phosphate index of sugarcane crop. Part II. Effect of different doses of phosphate in soils in relation to its absorption by sugarcane crops.
Indian Sugar, 1960, **10**: 79-82, bibl. 20, and 147-52, bibl. 3.

The phosphate contents of different leaves of Co.453 were studied in numerous samples, and the coefficient of variability was found to be least in the 4th leaf from the top. The P_2O_5 content of the leaves was determined in crops given 50, 100, 150 and 200 lb. P_2O_5 per acre as superphosphate. No significant differences were found, but there was a tendency towards maximum absorption from the lower levels of application.—Nat. Sugar Inst. Kanpur.

1556. SILVA, J. A., DARROCH, J. G., AND HUMBERT, R. P.
Economic evaluation of yield response of sugar cane as a function of soil potassium and of supplemental potash.
Soil Sci., 1960, **90**: 178-84, bibl. 13.

This investigation summarizes the results of 22 potash experiments on the island of Hawaii and 90 potash experiments on the island of Kauai harvested from 1950 to 1957. Polynomial yield equations were developed to describe the yield response surfaces for each of these islands. These equations explained 63·5% and 61·8% of the variation in yield on Hawaii and Kauai, respectively. An economic evaluation was made of the incremental yield increases from K applications, and this enables recommendations to be made for K applications over a range of soil K levels. [From authors' summary.]—Hawaiian Sugar Plant. Ass.

1557. DU TOIT, J. L., BEATER, B. E., AND SEXTON, T. A. F.
Liming in the sugar industry.
Bull. Exp. Stat. S. Afr. Sugar Ass. **11**, 1960, pp. 4.

On most cane soils in South Africa liming is only necessary to counteract the effects of sulphate of ammonia applications.

1558. SINGH, H., DE, R., AND SINGH, S.
Effect of boron and molybdenum in the presence of inorganic and organic nitrogen on the yield and quality of sugarcane.
Indian J. Sugarcane Res., 1960, 4: 166-70, bibl. 10.

Nitrogen at 100 lb./acre and P_2O_5 at 100 lb./acre were applied at planting time, and Mo as ammonium molybdate at 2 lb./acre and B as boric acid at 5 lb./acre were applied to the soil, or as a spray combined with soap solution, when tillering was completed (3 months). Fertilization with N and spraying with the micro-nutrients increased cane yield and the protein content of the plants.—Sugarcane Res. Stat., Jullundur Cantt., Punjab.

1559. JONES, T. A., AND HUMBERT, R. P.
A spectrographic study of the variations in the nutrient content of sugar cane.
Hawaii. Plant. Rec., 1960, **55**: 313-17.

The trace element composition is tabulated of 3 principal varieties when they were producing optimum yields.

Sugar cane—diseases and pests.

1560. DE CHARMOY, D. D'E.
Les ennemis d'origine végétale de la canne à sucre à la Réunion. (**Sugar cane diseases on Réunion.**)
Rev. agric. Réunion, 1960, **60**: 12-16.

Virus, bacterial and fungus diseases are discussed, and brief mention is made of control measures.

1561. HUGHES, C. G.
The diseases of sugar cane in North Queensland.
Cane Grs' quart. Bull., 1960, **24**: 22-6, illus.

Bacterial mottle, chlorotic streak, droopy top, leaf scald, pineapple disease, pokkah boeng, ratoon stunting disease, red stripe, top rot and yellow spot are described, with recommendations for control.

1562. FORBES, I. L., STEIB, R. J., AND CHILTON, S. J. P.
Ratoon stunting disease of sugarcane.
Bull. La agric. Exp. Stat. **532**, 1960, pp. 23, bibl. 21, illus.

A comparison of yields from infected cane and from cane treated for ratoon stunting was much in favour of the disease-free cane, the increase being greater in the first ratoon crop than in the plant cane crop. In Louisiana hot air treatment is preferred to hot water treatment, and recommendations are given for treating the cane, and for cultural care thereafter to reduce the risk of re-infection.

1563. SMITH, C. E. M., AND MANSER, P. D.
Recent work on ratoon stunting disease in Jamaica.
J. Jamaican Ass. Sugar Tech., 1958, **21**: 23-9, bibl. 3.

In Co.421 a consistently high correlation was found between symptom intensity and the effect of the disease. However disease-free material could not be selected simply by visual examination of nodal symptoms. Hot water treatment at 52° C. for 1–1½ hours brought yields back to normal and lessened the incidence of symptoms, these effects lasting up to the third ratoon. The responses of 23 varieties to inoculation and to heat treatment are shown.

1564. de Charmoy, D. d'E.

Au sujet d'une récente réapparition de gommose à la Réunion. **(On the recent reappearance of gumming disease in Réunion.)**

Rev. agric. Réunion, 1960, **59**: 287-94.

The present situation, symptoms, control measures and a list of resistant and susceptible sugar cane varieties.

1565. Syndicat des Fabricants de Sucre, Réunion.

Avis aux planteurs. **(The Society of Sugar Manufacturers' advice to planters.)**

Rev. agric. Réunion, 1960, **59**: 323-5.

Recommended control measures for gumming disease are, first, the use of resistant varieties, and secondly, disinfection of the cutting knives. The most resistant varieties listed are M.134/32, Ebène 1/37, R.445, R.447, B.41227 and Vesta, with M.63/39, R.469, R.484 and S.17 being listed as fairly resistant. The local plant bambou-balai is also a source of infection and should be destroyed.

1566. Innes, R. F., Manser, P. D., and Clarke, G. F.

Yield decline in sugarcane on part of Worthy Park.

J. Jamaican Ass. Sugar Tech., 1958, **21**: 1-8, bibl. 16.

Yield decline was associated with severe physical root damage and at times with pink wound staining. Outstanding yield responses were obtained with B.41227 when the soil was treated before planting with DD (20 gal./acre) and insecticides such as chlordane (2½ lb./acre). Although B.4362 responded to treatment with DD, it failed to give average yields. It has not yet been established that nematodes are the main cause of decline.

1567. Rangaswami, G., Vasantharajan, V. N., and Venkatesan, R.

The occurrence of root-knot nematodes on sugarcane and on some weeds.

Curr. Sci., 1960, **29**: 236-7, bibl. 7, illus.

Tylenchorhynchus sp. and *Meloidogyne javanica* identified as causal agents of a severe chlorosis in sugar cane.

1568. Muthuswamy, R.

Studies on the relative efficiency of seed treatment with some modern fungicides with and without aldrin on germination of cane.

Indian Sugar, 1960, **10**: 155-7, bibl. 5, illus.

Among numerous chemicals tested for the treatment of setts 0·25 lb. of 6% Aretan or 0·5 lb. of Agallol plus 0·2 lb. of Aldrex 30 in 10 gal. water had the best effect in hastening germination and in protecting the setts against termites.—Begg, Sutherland and Co., Marhowrah.

1569. Gupta, B. D.

The insect pests of sugarcane in India. VI. The stalk borer *Chilotraea auricilia* Ddgn.

Indian Sugar, 1960, **10**: 67-78, bibl. 11, illus.

The life history and distribution of *Chilotraea auricilia* in India are described. Recommended control measures include the removal of the late growth and water shoots after harvest, eradication of Johnson grass (*Sorghum halepense*) preferably by herbicides, 2 applications of 1% BHC emulsion, 0·1% endrin emulsion or 0·1% DDT emulsion, the first in September and the second in October. Attention to drainage is recommended in areas liable to waterlogging. [For Part V, see *H.A.*, 30: 4540.]—Ind. Inst. Sugarcane Res., Lucknow.

1570. Gupta, B. D.

Control campaign against stem borer, *Chilo tumidicostalis*, at Plassey (West Bengal).

Indian J. Sugarcane Res., 1960, **4**: 171-5, illus.

The life history and damage caused by this stem borer are described. Control methods included the destruction of the moths by light traps, the removal of the 3 top leaves, where most of the egg masses are deposited, and applications of endrin emulsion at 2·5 lb. acre. When mechanical control took place before and after spraying, the incidence varied from 6–20%, but when mechanical control was omitted after spraying, it varied from 30–52%. Mechanical control was not only superior to chemical control but also more economical.—Indian Inst. Sugarcane Res., Lucknow, U.P.

1571. Kalra, A. N.

Aerial spraying with endrin against sugarcane top borer.

Indian Sugar, 1960, **9**: 699-700, bibl. 3.

Applications (1 lb. actual endrin/acre) and results were erratic but generally favourable.

1572. Anderson, J., and Luckett, E. J. R.

Problems of grub control and varietal reaction to grub attack in the Isis area.

Cane Grs' quart. Bull., 1960, **24**: 30-1.

The heavy dosage of insecticides required and the sporadic nature of infestations militate against chemical control of *Pseudoholophylla furfuracea* and have led to the use of the grub-tolerant varieties C.P. 29–116 and N:Co. 310, of which the former is the heavier cropper.

1573. Moller, R. B.

Insecticidal experiments against soldier fly.

Cane Grs' quart. Bull., 1960, **24**: 29.

Control obtained with 4 and 8 lb. BHC gamma isomer per acre broadcast, worked in and left undisturbed for 4 weeks before planting.

1574. Doty, R. E.

Spreading poisoned rat baits by airplane. A progress report.

Hawaii. Plant. Rec., 1960, **55**: 293-300, bibl. 9.

Pellets applied at 10 lb./acre on sugar cane have proved effective.

Sugar cane—harvesting and by-products.

1575. King, N. J.
Some angles of mechanical cane harvesting.
Cane Grs' quart. Bull., 1960, **24**: 15-16, 21.

Lodge-resistant varieties and chemical leaf-desiccants discussed.

1576. Humbert, R. P., and Payne, J. H.
Losses from wet weather harvesting.
Hawaii. Plant. Rec., 1960, **55**: 345-8, bibl. 2.

Pre-harvest sampling techniques, especially of the sucrose : reducing sugar ratio, have shown that losses due to poor cane quality occur when the average daily rainfall during harvest exceeds 0·3 in. Additional losses through compaction and puddling of soils are estimated to reach $400,000 annually. The advantages of increased milling capacity, a shortened grinding season and the suspension of field work during adverse weather are discussed.

1577. Rohrig, P. E., and Ellis, T. O.
Sugarcane deterioration studies at Central Romana during 1958.
J. Jamaican Ass. Sugar Tech., 1958, **21**: 29-33, bibl. 2.

Data are presented from studies on 5 varieties. Average daily losses in lb. of 96% sugar per ton of cane resulting from field exposure after harvest over a period of 6 days ranged from 12·28 for B.43337 to 9·00 for B.37161.—Central Romana Corp., Dominican Republic.

1578. Réunion, Centre Technique de la Canne et du Sucre.
Le règlement des cannes d'après leur richesse en sucre à l'Île de la Réunion. **(Sugar cane regulations on Réunion Island based on the sugar content.)**
Rev. agric. Réunion, 1960, **60**: 5-12.

Improvements in quality resulting from the introduction of standards for planters and factories.

1579. Parish, D. H.
Protein from sugar cane.
Nature, 1960, **188**: 601.

A note on studies in Mauritius on amino-acid composition, nutritional value and extraction. A combination of protein and wax recovery may be economic.

Tea—general, varieties and propagation.

(*See also* 1592, 1642, 1669, 1684.)

1580. McWilliam, M. D.
The Kenya tea industry. Parts 1-3.
E. Afr. Econ. Rev., reprinted in *Tea*, 1960, **1**(2): 29-32, illus., (3): 17-20, illus., and (4): 13-17, illus.

The historical background, marketing problems and the economic factors which influence tea production are discussed.

1581. van Dijk, G.
Report to the Government of Iran on tea cultivation.
Rep. ETAP/FAO **1203**, 1960, pp. 13, bibl. 21.

Recommendations include the use of fertilizers, the establishment of Government tea nurseries and a research institute, and training of staff overseas.

1582. Barat, H.
Étude des possibilités de production du thé à Madagascar. **(A study of the possibility of growing tea in Madagascar.)**
Bull. Inst. Rech. agron. Madagascar, 1959, No. 3, pp. 64-7.

Consideration of available planting material, soils and climate, the latter compared with that of Mlanje in Nyasaland.

1583. Oragvelidze, I. Š.
The history of the tea industry in Georgia. [Russian.]
Subtrop. Kul'tury, 1959, No. 2, pp. 28-30, bibl. 9.

In 1958 60 factories produced 25,692 tons of black, 6,624 tons of green Bohea tea and 8,340 tons of green brick tea.

1584. Jakobašvili, B. A.
Anatomical differences between the main types of tea at Anaseuli. [Russian.]
Subtrop. Kul'tury, 1959, No. 1, pp. 39-46, bibl. 11, illus.

The internal structure of the leaves and shoots is compared in the Chinese, Japanese and Indo-Chinese hybrid forms of tea.

1585. Ramišvili, G. G.
The effect of tea breeding on the productivity of tea plucking labour. [Russian, with English summary ¼ p.]
Subtrop. Kul'tury, 1959, No. 1, pp. 31-4.

New varieties have been bred in which the flush is 18–45% larger than that in the local Georgian strains and yields are up to 30% greater.

1586. Bahtadze, K. E.
Selected varieties of tea and the task of seed production. [Russian, with English summary ¾ p.]
Subtrop. Kul'tury, 1959, No. 4, pp. 24-33.

New varieties of tea, developed by the author, have been tested over the past 13 years and found to give 28–35% yield increases with a larger average weight of flush and higher tannin and soluble solids contents. Seven varieties are now recommended for different climatic zones. Seed production in varietal seed gardens is discussed.

1587. Katayama, Y., and Nagatomo, T.
Investigations on some new crops. V. Wild tea plant. [Japanese, with English summary ½ p.]
Bull. Fac. Agric. Univ. Miyazaki, 1960, **5**: 157-71, bibl. 17, illus.

Distribution, habit and variation were investigated in wild tea from mountainous Kyushu. Wild tea was found to bear short-styled flowers. Certain morphological features, especially leaf shape, appeared to depend on light intensity. The progeny of these wild plants was also studied.

1588. Toyao, T.
Studies on the utilization of polyploidy in the tea plant. (Part 2.) [Japanese, with English summary ⅓ p.]
Study of Tea, 1960, No. 22, pp. 6-12, bibl. 16, illus.

In crosses between female tetraploids and male diploids, 35% set normal fruit, but in the reciprocal crosses only a few fruits with abortive seeds were produced. The F_1 triploid seedlings included euploids and heteroploids, the growth of the latter being very poor. [For part 1, see *H.A.*, 28: 1962.]

1589. Green, M. J.
Tocklai release clones. Pretreated cuttings: immediate and long term plans.
Two and a Bud, 1960, **7**(2): 7-9.

During 1959 6 standard, 2 high yielding, 1 high quality and 1 Darjeeling clones were released to estates. The pre-treated cuttings proved very successful, figures of over 80% strike being reported from all districts.

1590. Wight, W.
Green and brown tea cuttings.
Two and a Bud, 1960, **7**(2): 10.

No experimental evidence for the suggestion that cuttings should be taken only from wood just turning green to brown.

1591. Lju, G.-S.
Chinese practice in tea growing. [Russian.]
Subtrop. Kul'tury, 1959, No. 1, pp. 72-6, illus., and No. 2, pp. 64-6, illus.

An outline is given of methods of propagation, in particular the rooting of shoot and root cuttings, and of the establishment and after care of plantations.

Tea—climatic factors and irrigation.

(*See also* 1250.)

1592. Chaidze, I. I., Kovalenko, N. V., and Gvasalija, V. P.
The results of tea-growing experiments in the Transcarpathian province of the Ukraine. [Russian, with English summary ⅓ p.]
Subtrop. Kul'tury, 1959, No. 1, pp. 18-30, illus.

The great handicap to tea growing in this area has proved to be low winter temperatures. Cultural methods for overcoming this have been worked out, and strains showing the greatest frost resistance in the area have been selected.

1593. Takahashi, T., and others.
Studies on frost damage in the tea bush. (Part 6). On the height of cover for heat retention. [Japanese, with English summary ½ p.]
Study of Tea, 1960, No. 22, pp. 18-22, bibl. 2, illus.

Using straw mats as top covers the most effective height for protection was found to be 60 cm. above the bushes. Where side covers were also used higher covers (90–120 cm.) were better. [For parts 4 and 5, see *H.A.*, 30: 4563.]

1594. Katô, H., and Aono, H.
Damage to tea bushes in the Tokai District, especially in Aichi-Ken, caused by the salt-laden wind accompanying the typhoon "Ise-wan". The actual survey of the salt wind damage and the problem of establishing preventive measures. [Japanese.]
Study of Tea, 1960, No. 22, pp. 91-101, bibl. 12, illus.

1595. Gokhale, N. G., and Dutta, S. K.
Drought 1959-60.
Two and a Bud, 1960, **7**(2): 3-4.

With a total precipitation of only 104 mm. between November, 1959, and April, 1960, including a period of 86 days without rain, the Tocklai station had its driest winter on record, 270 mm. below normal. The first flush crop from unpruned areas was practically eliminated, and there have been many cases of die-back of branches and death of whole bushes.

1596. Torii, H., and Ôta, I.
The influence of light on the chemical constituents of tea seedlings. [Japanese, with English summary ½ p.]
Study of Tea, 1960, No. 22, pp. 70-6, bibl. 8.

Growing seedlings in the dark increased the caffeine content from 1·8 to 3 times and generally increased the soluble N: total N ratio. The asparagine and threonine content tended to increase in the seedlings grown in the dark, but the amount of catechins, particularly epigallocatechin gallate, was reduced.

1597. Ommanney, N.
Dense shade and its effect on quality of tea.
Nyasaland Fmr For., 1960, **5**(2): 12-13.

Induces rank growth with leaves of lower polyphenol content and consequently lower quality.

1598. Daraselija, M. K., and Gvazava, T. Š.
Methods of improving soil moisture conditions in tea gardens. [Russian, with English summary ½ p.]
Subtrop. Kul'tury, 1959, No. 2, pp. 3-14.

Overhead irrigation has proved the most effective method of overcoming drought in Georgian tea gardens. The highest yields were obtained when watering raised the moisture content of the soil to 90% of field capacity, yield increases of 25–30% being obtained. Frequent applications of 2 mm. were preferable to occasional drenching with 30–40 mm. This was especially so where the water contained much lime, when heavy applications were apt to raise the soil pH to levels above that tolerated by tea.

1599. Talakvadze, K. B.
The effectiveness of sprinkler irrigation in the tea gardens of Anaseuli. [Russian, with English summary ¼ p.]
Subtrop. Kul'tury, 1959, No. 3, pp. 13-22, illus.

Although the total annual rainfall in the principal tea growing areas of the U.S.S.R. is adequate, a dry spell often occurs during the main plucking period in May and June. Experiments conducted at Anaseuli since 1939 have shown that overhead sprinkler irrigation applied as required during the summer increased the soil moisture content in the rhizosphere by 2–4%, improved root and shoot growth and bud break, increased yields by 23–26% and also had a favourable effect on quality.

Tea—soil management and nutrition.

(*See also* 1598, 1599.)

1600. Middleton, R. V. D.
Contour terracing for tea estates.
Tea, 1960, **1**(3): 49-52, illus.

Advice on layout, including the siting of drains, with a table of contour terrace spacing.

1601. Bobohidze, I. N.
Studies on the mechanization of work in tea gardens. [Russian, with English summary ⅓ p.]
Subtrop. Kul'tury, 1959, No. 3, pp. 23-8, illus.

For inter-row cultivation on steep gradients a 3–3½ h.p., 2–wheeled tractor has been developed.

1602. Kaličava, A. D.
Reasons for discontinuing the annual winter cultivation of tea plantations. [Russian, with English summary ½ p.]
Subtrop. Kul'tury, 1959, No. 4, pp. 34-45.

Digging the inter-rows of closely-planted tea to depths of 15 and 25 cm. every winter caused serious injury to the roots, which at that time of the year did not regenerate well, and reduced subsequent yields. It is recommended, therefore, that winter digging should be carried out only once in every 3–4 years in conjunction with manuring and that in years in which the plantations are not dug the soil should be tilled in March to a depth of only 4–5 cm. with a cultivator or hoe.

1603. Fleming, S. D.
Couch—the old enemy of clean plantation crops.
Tea, 1960, **1**(1): 33-4, and (2): 17-18, illus.

Dalapon may safely be used in tea at all stages and does not persist or accumulate in the soil. It should be applied after pruning and before bud break is complete.

1604. Ram, C. S. V.
Foliar application of nutrients and rhizosphere microflora of *Camellia sinensis*.
Nature, 1960, **187**: 621-2.

One-year-old monoclonal selections of tea propagated from cuttings were grown in tea field soil in earthenware pots and each plant sprayed with 10 ml. of nutrient solutions. Foliar spraying with any of the inorganic or organic nutrients significantly reduced the bacterial population of the rhizosphere soil. The effect on the fungal population varied with the nutrient solution supplied, for example a 0·67M solution of potassium chloride significantly increased, and a 0·04M solution of magnesium sulphate significantly reduced, the population of fungi. It is suggested that differences in the rhizosphere microflora resulting from foliar applications of nutrients are probably due to qualitative and quantitative changes in the root exudates induced by the treatment.—Tea Exp. Stat., P.O. Devarshola, S. India.

1605. Gokhale, N. G., and Bhattacharyya, N. G.
Mineral composition of clonal tea leaf from North-East India.
J. Sci. Food Agric., 1960, **11**: 526-8, bibl. 11.

Chemical composition varied markedly between the 4 clones tested, 19/29/13, 20/23/1, 1/7/1 and 3/77. Clone 3/77 showed substantially lower S, Ca and Al contents; clone 1/7/1 was particularly rich in K and 19/29/13 in Mn. Marked variation in composition was also found with physiological age and date of sampling. With age S, N and P decreased and the remaining constituents increased. S, N, P and K increased as the season advanced from July to September, whereas Ca and Mn decreased.—Tocklai exp. Stat., Assam.

1606. Child, R.
The nitrogenous manuring of tea in East Africa.
The phosphatic manuring of tea in East Africa.
Tea manuring in East Africa. Part 3 — Potash.
Tea, 1960, **1**(1): 16, 31, (2): 39-40, and (3): 39-42.

During a 4-year pruning cycle on unshaded tea N in the form of sulphate of ammonia was applied at 0, 40, 80 and 120 lb./acre. No response was obtained during the first year, but a significant increase of crop was obtained in the 2nd year at 40 lb./acre. In the 3rd and 4th years application at 80 lb. gave significantly higher yields than those obtained with 40 lb. Phosphate fertilizers did not produce any significant response until the last year of the second pruning cycle. East African soils are rich in K, and no responses to K fertilization were observed.

1607. Oganov, G. M., and Osipov, G. I.
Measures for the prevention of nitrogen loss in tea garden soils of the Lencoran area of Azerbajdžan. [Russian, with English summary ¼ p.]
Subtrop. Kul'tury, 1959, No. 2, pp. 24-7.

During the autumn rains leaching of nitrate N reached 30 kg. or more per ha. Ammonia was less affected than nitrate, and intercropping with lupins reduced the loss considerably. The use of ground sulphur and ammonium sulphate is recommended.

1608. Oniani, O. G.
The determination of the potassium fertilizer requirements of tea gardens. [Russian, with English summary 1 p.]
Subtrop. Kul'tury, 1959, No. 2, pp. 15-23, bibl. 19, illus.

A marked decrease in the exchangeable K in the soil and the appearance of K deficiency symptoms in the leaves have been caused by applying only N and P fertilizers to Georgian tea gardens. The K content of the leaf should be used to determine the K requirements of the soil, less than 0·8% indicating deficiency and above 1% adequacy.

1609. Kawai, S., and Ikegaya, K.
The relation between the saturation degree of exchangeable calcium, potassium and magnesium of the soil and the growth of the tea plant. (Part 2.) A pot experiment with the yellow soil of the Makinohara Plateau. [Japanese, with English summary ½ p.]
Study of Tea, 1960, No. 22, pp. 81-90, bibl. 20, illus.

Seedlings of the Yabukita variety grown in this soil showed optimum growth when given 25% exchangeable Ca, 10% K and 5% Mg. Calcium above 75% was injurious. [For part 1, see *H.A.*, 28: 1998e.]

Tea—growth and physiology.

(*See also* 1587.)

1610. Torii, H., and Nakagawa, M.
The growth-promoting effect of gibberellin on the tea shoot (continued). [Japanese, with English summary ⅓ p.]
Study of Tea, 1960, No. 22, pp. 23-34, bibl. 1.

Spraying with GA increased the growth of tea shoots from 2·5, 2·2 and 3·5 mm. per day in the 1st, 2nd and 3rd plucking seasons to 3·9, 3·9 and 6·3 mm., respectively. The number of shoots and leaves were not increased, nor were the total N, caffeine, tannin and crude fibre contents of the leaves. The chlorophyll content, however, was reduced. The quality of the black tea made from the sprayed leaves was higher than that of the controls. [For the first part, see *H.A.*, 30: 4564.]

1611. Ali-Zade, M. A., and Kotomina, R. I.
The effect of gibberellin on the growth of young tea shoots. [Russian.]
Fiziol. Rast., 1960, 7: 343-4, bibl. 5, illus.

Tea plants sprayed 5 times in the autumn with GA at 200 mg./1 produced new growth in the leaf axils a few weeks later.

1612. Harada, S., Kano, T., and Sakai, S.
Studies on photosynthesis in the tea plant. (Part 4). Differences in the photosynthesis of different layers of leaves in a mature tea garden. [Japanese, with English summary ½ p.]
Study of Tea, 1960, No. 22, pp. 1-5, bibl. 7.

By removing either the upper 10-cm. layer of leaves or the lower 10-cm. layer and measuring photosynthetic activity, the midday depression in freshly-pruned tea was shown to be due to the lower leaves, which are thinner, larger and of greater chlorophyll content than the upper leaves. The midday depression was also found to be related to the degree of stomatal opening. [For part 3, see *H.A.*, 30: 4565.]

Tea—diseases and pests.

1613. de Weille, G. A.
Blister blight (*Exobasidium vexans*) in tea and its relationship with environmental conditions. [German summary ½ p.]
Neth. J. agric. Sci., 1960, 8: 183-210, bibl. 37.

A concise account is given of this disease in Indonesia. Factors unfavourable to the fungus are low R.H., high temperature and ultra-violet insolation. A method of forecasting epidemics has been devised, which is based on running daily totals of sunshine weighted according to the deficiencies of the previous 3 days. This enables dusting with fungicides to be done only when necessary.—Roy. Neth. met. Inst., de Bilt.

1614. Mukerjea, T. D.
Destructive eelworms of tea seedlings.
Two and a Bud, 1960, 7(2): 5-6.

Symptoms induced by *Meloidogyne* spp. in tea are briefly described. Soil fumigants are recommended, although neither Nemagon nor Nematox gave 100% control in recent experiments at Tocklai.

1615. Džaši, V. S.
The tea moth as a pest of the coarse tea leaf (Lao-cha). [Russian, with English summary ⅓ p.]
Subtrop. Kul'tury, 1959, No. 3, pp. 3-12, bibl. 8.

Although *Parametriotes theae* does little damage to the flushes plucked for the manufacture of black and green teas, infestations of up to 33% were found in the coarse leaves picked for making brick teas. The removal of the coarse leaves is therefore a necessary part of the control programme.

Tea—plucking, manufacture and composition.

(*See also* 1597, 1599, 1605, 1610.)

1616. Mdinaradze, V. L., Dandurov, A. B., and Kvančahadze, G. Š.
The tea plucking machine ĆU-1.6s. [Russian, with English summary ¼ p.]
Subtrop. Kul'tury, 1959, No. 4, pp. 46-8, illus.

A study of work fatigue in the operation of the plucking machine ČU-1.6s. [see *H.A.*, 29: 4116] with recommendations for constructional improvements.

1617. Deuss, J. J. B.
Le contrôle dans les usines de thé et plus spécialement les rapports entre les poids des feuilles fraîches, des feuilles flétries et du thé sec obtenu. (**Control in tea manufacture, with special reference to the weight relationships between fresh and wilted leaves and the dry tea obtained.**)
J. Agric. trop. Bot. appl., 1959, **6**: 620-36.

Based on the initial water content of freshly harvested tea leaves over a range of 70 to 85%, tables give the necessary moisture loss during wilting to obtaining final products with moisture contents of 3, 4, 5 or 5½%. These tables utilize the ratios of final weight to weight after wilting and final weight to fresh weight. Several examples of the practical application of the tables are discussed in detail.

1618. Khrishna, K. V. S.
A new technique of miniature manufacture of tea.
Plant. Chron., 1960, **55**: 234-5.

A small scale laboratory method for determining the liquoring property of individual bushes is described, which can be used on estates for testing and grading mother bushes and selected lines.

1619. Džemuhadze, K. M., and Nestjuk, M. N.
Flavonoids in tea leaves. [Russian.]
Doklady Akad. Nauk, S.S.S.R, 1960, **131**: 203-5, bibl. 8.

The compounds present in first, second, third and mature leaves and stems of the tea variety Fleš were investigated by paper chromatography. There were fewer compounds present in stems than in leaves, the kaempferol compounds being absent. Under ultraviolet light, however, a blue spot, close to chlorogenic acid, was found which is not normally found in Chinese varieties of tea, but which is characteristic of Assam varieties. Differences in the flavonoid content of the different types of leaves are tabulated.

1620. Bokučava, M. A., Popov, V. R., and Knjazeva, A. M.
The chemical composition of the Indian tea leaf and the quality of black tea. [Russian.]
Subtrop Kul'tury, 1959, No. 1, pp. 66-70, bibl. 14.

The contents of tannins and soluble solids in the Assam, Darjeeling, Coonoor and Dooars types of tea before and after processing are compared with those in Georgian tea. On this basis the new Indian rapid fermentation method is recommended for the U.S.S.R.

1621. Buzun, G. A.
Biochemical changes in tea from the Krasnodar region during processing. [Russian.]
Subtrop. Kul'tury, 1959, No. 3, pp. 29-35, bibl. 15.

Mainly in tannin content and the colour of the infusion.

Sundry crops.

1622. Vaughan, J. G.
Structure of *Acrocomia* fruit.
Nature, 1960, **188**: 81, bibl. 2, illus.

Histological details of the endosperm to differentiate the products of this S. American genus from those of the coconut and oil palm.

1623. Roy, S. K.
Embryology of *Eugenia malaccensis* Lam.
Curr. Sci., 1960, **29**: 189-90, bibl 3, illus.

Polyembryony and other features.

1624. Rao, U. N., and Muthuswamy, S.
An abnormal jack fruit.
South Indian Hort., 1958, **6**: 81-2, bibl. 1, illus.

A normal fruit, a distorted fruit and a male inflorescence on the same stalk produced by the fusion of a female spike and a male catkin.

1625. Rao, I. K. S.
The langsat—a new fruit for the humid zones in South India.
South Indian Hort., 1958, **6**: 119-20, bibl. 3, illus.

Lansium domesticum, a native of Malaysia, has become acclimatized on the Nilgiris. Methods of propagation and culture are briefly outlined.

1626. Milsum, J. N.
The rambutan.
World Crops, 1960, **12**: 254-5, 264, bibl. 1, illus.

A short descriptive article on *Nephelium lappaceum*.

1627. Sriram, T. A., and Raman, K. R.
The performance of white sapote (*Casimiroa edulis*) on the Nilgiris.
South Indian Hort., 1958, **6**: 98-101, bibl. 6, illus.

Details of the good growth and yield of the Lomita variety, introduced in 1950 from the U.S.A.

NOTES ON BOOKS AND REPORTS.

Books.

1628. Audus, L. J.
Plant growth substances.
Leonard Hill, London, 2nd edition 1959, 10 × 6 in., pp. xxii + 553, bibls. numerous, illus., 65s.

The publication of this enlarged, second edition only six years after the original publication acknowledges the incessant growth of the subject matter, the intense industry of its author and a receptive readership.

When reviewing the first edition [*H.A.*, 24: 1018] I suggested that we were entering a new phase in the history of plant growth substances but that auxin would not seem less important as new substances were discovered. This has proved to be the case, for the advent of the gibberellins has revealed the probability of co-operative action with auxin. Indeed it is the "multiple physiological action" of auxin which still seems to contain the key to the general problem of growth control of the plant.

The substance of the first review still obtains. The one entirely new chapter of the second edition (Chapter IV) is in fact devoted to discussing the mechanism of auxin action at the cellular level, and, although the author admits that "no satisfactory and comprehensive explanation can yet be given", it is pertinent that he observes mounting support for some "master reaction" as opposed to discrete actions by different auxins. The critical property of auxin is the promotion of cell extension growth, but, as Professor Audus points out, protein synthesis is a normal concomitant of this process so linking up with the protoplasm itself and the whole metabolism of the cell. In this sense, the definitive property of auxin which led to its discovery signifies a crucial role in cellular physiology. Furthermore, no less significant is its polar movement in the plant, for this relates at once to the axile form established at the outset of embryo development—the basis of stem-root organization and of inevitable ontogenical progress towards maturity. So while there is reproduction and senescence in the upper part of the plant, lower down there is the reverse tendency to remain "juvenile", which finds a practical outlet in the disposition to regenerate vegetatively. However, the onset of flowering itself involves new spurts of cell extension in anther and ovule with auxin production once again a key metabolic manifestation; so to the beginning of a new sexual generation.

There is another way of looking at this great physiological field. Having chanced upon auxin, has there perhaps been an over-emphasis on researches elucidating its action to the neglect of other hormonal substances also present in the plant? On the chemical side the advent of chromatographical separation and analysis has certainly revealed the presence of several discrete substances with positive and negative (inhibiting) action in terms of cell extension; this is in line with the conception of a family of related substances and with our knowledge of different forms of auxin in terms of metabolic availability or of precursor substances. Again, hormonal substances other than auxin have long existed in the realms of hypothesis; yet here also the failure so far to isolate such hormones as "florigen" (flower-forming hormone) supports rather than detracts from the diverse universality of auxin. Gibberellin, however, is a substance with hormonal qualities which is certainly not auxin, but which promotes extension growth of stems. Significantly, gibberellin is devoid of other auxin attributes and lacks its polarity. There is also evidence that it is really a complementary factor to auxin, and as such may manifest its action wherever auxin is involved. Again the chromatographic method has revealed several probably related substances suggesting intermediate stages in biosynthesis.

To revert to the book, the fifteen existing chapers are retained but one has been renamed and brought forward in order. This is the new Chapter IX "Auxins and the shedding of organs" and includes much recent work on the role of auxins in controlling normal abscission, and on the use of synthetic growth substances to *promote* abscission, both as defoliants and for thinning blossom and fruit. While retaining the same titles, several other chapters have been thoroughly revised, notably those dealing with selective weed killers and with flowering and reproduction. In the former (Chapter XI) there is now included a section on the many herbicides in use, which, while not of the auxin type, are selective in their action, while in respect of the latter (Chapter XIII) there has been a considerable broadening of experimental knowledge on sexual reproduction of both higher and lower plants in terms of hormone mechanism.

There has in fact been revision in varying degree throughout the book and it has been fascinating to play the detective and locate the changes, down to the modification of single sentences. The overall result is a comprehensive presentation, which is up-to-date in its discernment of current research trends. Though considerably larger than the original edition, the use of a rather smaller print on a larger page with wider margins, and on smooth instead of a rough textured paper, has resulted in a still more attractive book. There are additional illustrations and a number of diagrams and drawings previously inserted as plates are now accurately positioned in the body of the text.

In his very first chapter on the nature of plant growth and its control Professor Audus refers to its genetic aspect. There is in fact stark contrast between the great variety of growth and form associated with genetic "make-up" and the universality of physiological attributes, including that of auxin action. In seeking the intermediary action of hormonal substances in the mechanism of gene expression the discovery of the gibberellin group is cited as confirmatory evidence. What strikes the reviewer is something quite different, namely that gibberellin, like auxin and penicillin before it, is the product of fungal metabolism, thus suggesting physiological linkage between plants occupying very different levels in the classification system, and a still wider " universality" of physiological activity. To all who purchased the first edition of this book the aquisition of its successor is a logical step. To those who did not this is a hearty commendation to buy. E.S.J.H.

1629. Backeberg, C.
Die Cactaceae—Handbuch der Kakteenkunde. Band IV. Cereoideae (Boreocereeae). **(The Cactaceae—Handbook of cactus information. Vol. IV. Cereoideae (Boreocereeae).)**
G. Fischer, Jena, 9½ × 7 in., in 6 vols; Vol. IV, 1960, pp. 1927-2629, illus., DM.91.

In *H.A.*, 30: 3018 my colleague discussed briefly the background to this impressive quasi-monograph and its status in the literature. Attention was drawn to the world-wide flux that exists in the minds of those striving to secure a generally acceptable classification for Cactaceae.

In fact, the author's conceptions are by no means universally recognized and are frequently attacked by the architects of widely conflicting systems of nomenclature. But no other contemporary worker, whatever his taxonomic tools, has attempted a comparable essay—the first of its kind since Britton and Rose's monograph completed in 1923 and partly brought up to date by Marshall and Bock's 1941 supplementary publication.

Volume IV covers a work-out and description of Cereoideae (Boreocereeae) bringing us to numbered genus 176 (*Discocactus*). ("Genera" without numbers in earlier volumes are *nomina nuda*—the entity recognized but the validation lacking). So far 2717 illustrations have appeared in the text and appendices. Many of these, including a fair selection in colour, well illustrate diagnostic characters. Others give only general impressions of gross form. The text is in fact supported by a high proportion of excellent plates that decorate the volumes rather than contribute towards close understanding of all species of a particular genus. The task is very large but some line drawings could fill the vacuum. Again there are many new names and combinations to be noted by compilers of repertoria and lists. An important feature of Volume IV is the generous treatment of the genus *Melocactus*—one virtually impossible to study in cultivation.

A general index will be provided in Vol. VI, but for convenience of reference one would have appreciated separate facilities for consulting individual volumes.

The value of this large work is clear. The system of nomenclature can be appraised only from its employment in practice. R.S.B.

1630. Bloom, E. V.
Collectors' cacti.
Collingridge, London, 1960, 8½ × 5½ in., pp. 123, illus., 30s.

In horticulture many of the treasures of cactus grower and dealer are imported, often at considerable expense, from Mexican sources. The present essay, including original line drawings by the then 18-year-old author, deals with a selection of such plants. There is no definite coverage, and we are treated to a discussion of the characters, morphology and cultivation requirements of those genera apparently best known to Mr. Bloom. *Ariocarpus* and other low-growing Cactaceae hailing from arid Mexican wastes receive ample recognition. Oddly enough, THE "collectors'" genus of cacti—*Mammillaria*—occurs only as a pale shadow in the listing of some old synonyms. Much of the well-written text suggests a serious attempt to explain the make-up and behaviour of the most expensive "snob value" items in the cactus nurseryman's price list. But certainly what is presented is favourably unique. A glossary is provided to explain many of the terms utilized to discuss the morphology of the plants reviewed.

The advice on cultivation attempts to compare glasshouse bench practice with habitat conditions, but the deducing of fussy methods is not strongly encouraged. A number of errors should be corrected in a further edition. *Pilocanthus* Backeb. is misrendered "*Piltocactus*" on page 82 and also in the Index. "Primodium" in the Index occurs properly in the text as "primordium", etc. R.S.B.

1631. Chupp, C., and Sherf, A. F.
Vegetable diseases and their control.
Ronald Press, New York, 1960, 9 × 6 in., pp. 693, bibls., illus., $12.

The main part of this publication consists of descriptions of some 300 diseases and disorders of specific vegetable crops. There are also chapters on damping-off diseases of seedlings, pathogens with a wide host range (e.g. *Sclerotinia* spp., *Verticillium* spp. and certain viruses), minor element deficiencies, nematodes and soil sterilization. Although the book has apparently been written mainly for the American reader, it includes descriptions of most of the major vegetable diseases likely to be found in all temperate and subtropical countries. Potato diseases are not included.

Symptoms are described in a manner easily understood by the non-specialist reader, and the recommendations for control are clear and specific, not only advising which sprays to use but also indicating modifications of cultural practice where appropriate. A further valuable feature is the listing of varieties known to be resistant to the various diseases. The text is clear and most of the photographs are good. For the purposes of the reader requiring a general conspectus of the subject the publication is excellent and reflects the considerable experience of the authors in the field of advisory plant pathology.

Unfortunately, however, the book does not entirely fulfil its authors' hopes (as stated in the preface) that it will also serve as a text book for the advanced specialist. Although numerous references to the literature are included, some important ones have been omitted and only rarely is there any mention in the text of the authors quoted in the citations. Strangely enough the converse is also true—where authors are quoted in the text there is often no mention of their work in the references. With a few minor exceptions there are no illustrations of the pathogens—often a prime requirement for accurate diagnosis. There are also a number of mistakes in the book, occasionally in the references (e.g. Garrett, S. D. page 80), but, of more importance, in the description of diseases or their control. Two typical examples are the inaccurate account of the work on big vein of lettuce and the statement that bordeaux mixture is used for the control of *Didymella* stem-rot of tomato.

It is impossible to escape the impression, when reading this book, that the authors have attempted to cover too much ground. In spite of this, however, its very practical approach makes it a valuable supplement to the other literature on the subject.

W.G.K.

1632. COMMITTEE ON TRANSACTIONS IN SEEDS.
Plant breeders' rights.
H.M.S.O., London, 1960, pp. 121, 6s.

This report covers the methods, principles and extent of plant breeding in the United Kingdom and elsewhere, breeders' rights and safeguards, the encouragement of plant breeding and the conditions and procedure for the granting of rights. Amongst the plants considered are roses, vegetables, fruit trees and bushes, chrysanthemums, flowering trees and shrubs, and herbaceous and alpine plants.

1633. DAUBENMIRE, R. F.
Plants and environment: a textbook of plant autecology.
John Wiley and Sons, Inc., New York, and Chapman and Hall, Ltd, London, second edition 1959, 9×6 in., pp. 422, bibl. 773, illus., 42s.

This is a revised edition of a book that has become a standard work. As its sub-title implies it deals with the interrelationships between the individual plant and its environment, and, while it deals more particularly with naturally occurring plants, considerable portions of it, especially the chapters on water, temperature and light, should be of interest to horticulturists. In the water chapter such topics as the evaporative power of the air and the effectiveness of precipitation are discussed. In a chapter on temperature information is included on the stimulatory effects of low temperature and the influence of temperature on plant diseases. In another chapter on light the matters discussed include the relative importance of light quality and the effects of the atmosphere on light. Other subjects dealt with include atmospheric pollution, wind effects and soil salinity.

J.F.T.

1634. EHLERS, M.
Baum und Strauch in der Gestaltung der Deutschen Landschaft. **(Tree and shrub in the shaping of the German landscape.)**
Paul Parey, Berlin and Hamburg, 1960, 7½ × 5 in., pp. 279 + illus. pp. 31, bibl. 71, DM.24.

Whatever the other merits of this book may be, the clarity of its arrangement is outstanding. This applies particularly to the main section (pp. 12–239), in which trees and shrubs indigenous to Germany are described and listed in the alphabetical order of their Latin names (though supported by an index of common names). The special feature of these descriptions is that practically every species of the 58 genera dealt with has two opposite pages devoted to it, and in these the following subjects are discussed in the same sequence throughout: growth and performance; propagation and commercial plant sizes in the nursery; incidence in natural plant associations; climate, soil and growing conditions; uses and care. In the paragraph on plant associations use is made of 48 numbers referring the reader to another section (pp. 242–67) where details of particular associations are given. Among other information provided the response of the plant to air pollution is not forgotten.

At the present time, when there is ever-increasing interest in landscape planning, including such activities as the stabilization of river banks or of soil that is subject to wind erosion, the screening of industrial plants, the creation of playing fields, etc., the information on trees and shrubs presented here is particularly welcome. Much of the book, which closes a gap in the German literature, should be of interest to the British planner and landscape architect. It concludes with an appendix containing 50 photographs on art paper.

V.H.G.

1635. FRIEDRICH, G. (Editor).
Der Obstbau. **(Fruit growing.)**
Neumann Verlag, Radebeul b. Dresden, 1960, 3rd edition, 10 × 7 in., pp. 797, bibl. [classified] pp. 17, illus. DM.32.

For a review of the first edition of this book see *H.A.*, 27: 962. In the third edition, the publication of which after so short an interval indicates the urgent demand for such an ambitious and comprehensive manual, Professor Friedrich remains the principal author. He contributes a majority of the chapters, and he is supported by the same panel of East German authors, to whom one new name, Dr R. Schuricht of Dresden-Pillnitz, has been added.

While the subject matter of the first and third editions is, in general, identical, the arrangement of the individual contributions has been greatly changed with a consequent improvement in lucidity. In the process the book has also been enlarged by some 60 pages and the number of coloured illustrations of fruits has been slightly increased. The evaluation of the book by the first reviewer holds good for the third edition. V.H.G.

1636. Gunther, F. A., and Jeppson, L. R.
Modern insecticides and world food production.
Chapman and Hall, London, 1960, 9 × 6 in., pp. 284, bibls. illus., 50s.

This is a book about insecticides and acaricides, with the need to increase food supplies kept in mind; it therefore differs markedly in approach from Ordish's "The Untaken Harvest", and one cannot turn to it for much data concerning crop losses due to pests. On the other hand, as an introduction to economic entomology and to the roles played by suitable chemicals in the control of invertebrate pests, it could hardly be bettered. All the compounds of any significance today are dealt with, using wherever possible the recommended common name, or where one does not exist, the commercial short name; alternative short names are given, as is also the correct chemical name, but there are no formulae.

The use of insecticides is set in perspective, and then various problems associated with their use are considered. These include getting the toxicant to the right sites of action and maintaining it at an effective level for the right time, the effect on the other arthropod members of the environment, the determination of residues present at harvest and their significance, and the major problem now facing economic entomology, namely, resistance by insects and mites to chemical control. The scientific names for pests mentioned in the text by common names are given in one appendix, and another gives approximate comparative figures for the mammalian toxicity of over 100 pesticides.

The book is well printed on, to the present reviewer's delight, non-glossy paper; the type used for numerals is, however, not very satisfactory, the figures 3 and 5 being hard to distinguish. Printer's errors are rare, but it is unfortunate that this effort by a British publisher to produce a book by two American authorities should be marred by the misspelling of 'nematicide'; even the Americans do not commit 'homocide'.

It is unlikely that this book will be read by the man-in-the-street; it is too scientific for that. There is, therefore, still room for, say, a Penguin to carry the fight against ignorance and fear to the main mass of, at any rate, the British public, who must consume food largely protected by chemicals at some stage or other of its production, storage, transport and marketing. A.H.M.K.

1637. Higgins, V.
Succulents in cultivation (cacti included).
Blandford Press, London, 1960, 8½ × 5½ in., pp. 168, illus., 18s. 6d.

Among a plethora of recent popular books on the hobby of growing succulents this one stands out in many ways, even among Mrs Higgins' own many polished productions. It is very well written and attractively presented, with a quite exceptional collection of illustrations, all from the author's own collection at Croydon. It is gratifying at last to see 34 of Mrs Higgins' admirable watercolours so well reproduced, and equally commendable are the 72 photographs by Mr J. E. Downward. These cover a well-balanced cross-section of all succulents, and in addition indicate the types that can be successfully cultivated even in adverse urban areas. Following introductory chapters on cultivation, 161 genera are surveyed alphabetically under 11 families, the Cactaceae given their rightful place as one of these families—an arrangement that greatly simplifies reference and helps to clear up one of the many muddles in current thought about these plants. The cultural advice is based on many years of personal experience, and the use of plastic pots as distinct from the old porous type is one of many useful hints.

Nomenclature is always a problem for any writer on succulents, who cannot hope to please all adherents of rival schools of thought. The approach here is conservative and a good midway course, giving offence only to a few purists on naming (as in some of the *Senecio* species) and to some who miss mention of the many lovely *Haageocerei* and *Borzicacti* from South America now invading collections in large numbers. But this is a trifling point in a book that maintains a high standard throughout and can be confidently recommended to all succulent-lovers, both new and experienced. G.D.R.

1638. Horsfall, J. G., and Dimond, A. E. (Editors).
Plant pathology: an advanced treatise. Vol. III. The diseased population, epidemics and control.
Academic Press, New York and London, 1960, 9½ × 6½ in., pp. 675, bibls. numerous, illus., $22 or £7 17s. 6d.

The first two volumes of this treatise were reviewed in *H.A.*, 30: 6284. The 14 chapters in this present volume, by various authors and with lengthy bibliographies, deal with inoculum and its dispersal by various means, epidemics and their control by quarantine, cultural practices, soil treatment, fungicides, biological methods and the production of resistant varieties. The broad and comprehensive treatment of these subjects provides a valuable conspectus of the whole field of plant pathology, and in addition the full indexes enable these volumes to be effectively used as works of reference.

1639. HYAMS, E.
Odhams fruit growers' encyclopaedia.
Odhams Press, London, 1960, 9 × 6½ in., pp. 253, illus, 30s.

This expensive book is far from being the reliable source of information that its title suggests. Its aim, according to the author's introduction, is to serve the needs of amateur and commercial fruit growers. Although amateurs will find much to amuse and entertain them in this mixture of ancient lore and modern knowledge, most commercial growers will probably detect so many inaccuracies and omissions that they will feel unable to rely on it. One part alone is above criticism. This consists of some 40 excellent photographic illustrations of fruit pests and diseases, largely the work of the Shell Chemicals Studio. The line drawings unfortunately vary from very good to very bad.

1640. JACKS, G. V., TAVERNIER, R., AND BOALCH, D. H. (EDITORS).
Multilingual vocabulary of soil science.
F.A.O., Rome, 2nd edition, 1960, 11 × 8 in., pp. 430, 22s. 6d. or 24s. 3d. post free.

This is a revised edition of the vocabulary mentioned in *H.A.*, 25: 4456. The languages covered are English, French, Spanish, German, Portuguese, Italian, Dutch, Swedish and Russian. There is a separate index for each language; the terms included are grouped by sections according to subject, and explanations of their meaning are given in all languages.

1641. KOTTE, W.
Krankheiten und Schädlinge im Gemüsebau und ihre Bekämpfung. **(Vegetable diseases and pests and their control.)**
Paul Parey, Berlin and Hamburg, 3rd edition 1960, 9½ × 6½ in., pp. 386 + 8 colour plates, bibl. 1,006, illus., DM.50.

The first edition of this book appeared during the war and was briefly noticed in *H.A.*, 18: 2305 after an inevitable delay of 4 years. Since then the manual has been changed out of all recognition and has acquired many of the attributes of a standard work. In the course of this thorough revision the book has also been much increased in size, despite the elimination of certain crops, such as potatoes and spice plants, which are not vegetables in the narrower sense of the term.

The result may be described as a collection of 21 monographs on the troubles of individual crops ranging from brassicas to mushrooms. In each case the author follows the same pattern; he begins with bacterial and fungal diseases, then turns to pests and later to viruses, concluding with physiological ailments such as climatic or nutritional disturbances. It goes without saying that the recommendations on chemical control have been brought up to date and that the notes on virus diseases have been considerably extended in line with modern trends. Much is also made of our growing realization that it is not enough to keep the enemies of cultivated plants at bay, but that it is necessary to suit the plants' specific requirements if physiological maladies are to be avoided.

The main section of the book is preceded by introductory chapters on the causes of damage to vegetable plants and on diseases and pests common to several vegetables; it is followed by a chapter on diseases and pest control in general, dealing with cultural measures, biological control, soil sterilization, seed disinfection, spraying techniques, fumigation, etc. The bibliography of over 1,000 references is a very useful addition. The value of this textbook to commercial growers and their advisory officers is enhanced by 160 clear text illustrations and 8 very good colour plates. V.H.G.

1642. MUELLER, W.
Bibliographie des Kaffee, des Kakao, der Schokolade, des Tee und deren Surrogate bis zum Jahre 1900. **(Bibliography of coffee, cacao, chocolate, tea and their substitutes up to the year 1900.)**
Walter Krieg Verlag, Vienna, 10 × 7 in., 1960, pp. 227, illus., 300 Austrian Schillings.

Generally speaking, bibliographies are dull or excruciatingly dull, but there are exceptions and this is one. Some emerge from obscurity by the brightness of the sources of information afforded to the scientist, others rather by their historical value. Mueller's belongs to the latter category.

There have been many bibliographies on coffee and cacao, notably those issued by the U.S.D.A. Foreign Agricultural Service and the U.S.D.A. Library and by the Inter-American Institute at Turrialba and one by Mueller himself on cacao in *Gordian* in 1951 [*H.A.*, 22: 943]. The historical section of this last work affords the basis for part of the present publication. In addition the author has in the last ten years examined sources of information in the new world and the old, including the catalogues of the national libraries. Here is the fascinating result, a collection of annotated references to the cultivation, manufacture and use of three blameless plants, which have contributed much to human comfort.

The more than 1,500 references show them to have many noble properties. Do you want to cure that slight craving for gin, to clear the blood, encourage virility, soothe your arthritic joints or even merely ensure health, intelligence and high moral standards? Any or all of them will do the trick. Do you wish to know how to prepare them to the best advantage? Here you will find enough answers to satisfy—or dissatisfy—the most inveterate bibber. But perhaps the reviewer's passion for these noble weeds led him to extravagance when he used the word "blameless", judging at least by the number of legislative ordinances, royal decrees and vituperative pamphlets also devoted to them. Thus coffee is also termed the suicide herb and the ruin of mankind and is roundly abused in many quarters. Cacao comes off rather more lightly, since Chesterton's scathing lines on its ignobility appeared first in 1914, while one author even happily describes tea as the guardian of the home and of the health of the soldier, but even tea has its detractors.

The Germans, especially, have paid much attention to substitutes for coffee and describe more than 40 of them, prominent among these being rye, ground- and other nuts, and acorns. Maté, *Veronica* and the leaves of *Rosa canina* are discussed as worthy substitutes for tea.

We thoroughly recommend this pleasantly illustrated and discursively annotated work, to be taken as a bedside book with a little hot toddy. D.A.

1643. RUHLAND, W. (EDITOR).
Handbuch der Pflanzenphysiologie. Band V. Die CO_2-Assimilation. Teile 1 und 2. **(Encyclopædia of plant physiology. Volume 5. Carbon dioxide assimilation. Parts 1 and 2.)**
Springer-Verlag, Berlin, Göttingen and Heidelberg, 1960, 10 × 6½ in., pp. xl +1013 and xvi + 868, bibls., illus., DM.530 (subscription DM. 424) for both parts.

As in previously published volumes some contributions are in German and some in English. Part 1 deals with carbon dioxide and carbonic acid and their occurrence in nature, and the photosynthesis of green plants. This second section is by far the larger and includes articles on measuring photosynthesis, the physiological apparatus of photosynthesis (i.e. pigments and plastid formation), the efficiency of photosynthesis and the analysis of photosynthetic processes. Part 2 is continued from Part 1 with articles on the general physiology and ecology of photosynthesis. Two final sections cover the photosynthetic bacteria and chemosynthesis.

1644. SINGH, L. B.
The mango.
Leonard Hill, London, and Interscience Publishers Inc., New York, 1960, 10 × 6½ in., pp. 438, bibl. 25 pp., illus., 84s.

Perhaps the best approach to this book is in Eastern fashion by looking at the last pages first. Here 25 pages of references to scientific literature bear witness to the remarkable quantity of study and research already devoted to the mango and sadly in need of compilation, and also to the equally remarkable thoroughness and erudition of the author. In recent years there have been only a very few books written on the mango and these have been largely concerned with varieties. This is the first textbook of which we are aware that deals fully with the culture of the crop.

Dr. Singh's approach to his task is now almost traditional, and the familiar gamut of history, geographical distribution, botany and breeding, climate and soil, varieties and propagation, culture and plant protection, marketing and uses is covered with painstaking thoroughness. Nor is the author's wide coverage limited to India, although clearly by far the most work on mangoes has been done there, but embraces studies, varieties and maladies from other areas, particularly America and the Pacific.

As would be expected knowledge of the mango tree is uneven and there are gaps, e.g. as regards its nutrition and physiology, which will be filled in time. The strong sections of this book, however, where the author is clearly supported by much sound study, deal with the pests and diseases of the tree and their control, its vegetative propagation and the terrifyingly large range of varieties.

Production and printing are excellent and, since this is the first of a series of "World Crops Books", we are encouraged to look forward to its successor. The illustrations are, on the whole, good: more coloured plates of the varieties would have much increased the usefulness of this section, whereas, on the other hand, some of the line drawings are redundant. It is, for example, sufficient to call a spade a spade and unnecessary to draw a picture of it complete with scale.

The mango is steadily spreading to the markets of temperate lands and is obviously a crop with an immense future. As more and more Englishmen demand their "cuckoo's joy" or "Cupid's favourite" and Frenchmen their "abricot de St. Domingue", so will horticulturists in the warmer countries need to employ more scientific and technical skill in mango production. The author and publishers are to be congratulated on having placed so necessary and so well written a manual in their hands. G.E.T.

Annuals and reports.

(*See also* 195, 585, 1037, 1176.)

1645. BASUTOLAND.
Annual Report of the Department of Agriculture for 1959, 1960, pp. 98, illus.

The experiments described include nutritional studies with beans and tomatoes, in which responses to Mo, amongst others, were obtained.

1646. BRITISH COLUMBIA.
Fifty-fourth Annual Report of the Department of Agriculture, 1959, 1960, pp. 73.

Top and small fruit production; plant protection problems briefly noted.

1647. BRITISH GUIANA.
Annual Report of the Director of Agriculture for the year 1959, 1960, pp. 76.

Sugar-cane: Promising varieties undergoing further testing are D.37/45, B.45137 and D.141/46. Field trials have shown that simpler cultivation techniques are as effective as those in use and that the effects of flood-fallowing on tilth are more persistent than those of mechanical cultivation. Factors limiting yield appear to be soil moisture and soil aeration at all times and soil salinity under drought conditions. Fertilizer experiments indicated ammonium sulphate to be slightly superior to urea as a source of N, but diammonium phosphate and triple superphosphates were equally effective sources of P. An epidemic of rats produced by drought conditions was brought under control by the use of endrin and zinc phosphide pellets. *Coconuts:* Significant responses were obtained to a mixture of 20 lb. ground limestone, 4 lb. sulphate of ammonia, 3 lb. triple superphosphate and 3 lb. muriate of potash per tree. Effective control of the borer *Castnia daedalus* was obtained with a 1% spray of dieldrin. *Citrus:* Dressings of an 8:12:15 mixture of NPK, applied at the rate of 5–6 lb. per tree just before bearing, have proved beneficial, as have 10 lb. of ground limestone every 2 or 3 years. Zinc deficiency symptoms in one area responded to zinc sulphate treatment. Brown rot disease was effectively controlled with 5 lb. Perenox per 100 gal., black bees by baiting with malathion and sugar and citrus aphids with nicotine and malathion.

1648. COLONIAL PESTICIDES RESEARCH UNIT.
Annual Report of the Colonial Pesticides Research Unit, Arusha, Tanganyika, East Africa, for 1959-1960. (***Progress Report No. 26***), 1960, pp. 26, illus., 5s.

Insecticides: The 40% yield increase obtained in the first year of spraying coconuts against *Pseudotheraptus* is unlikely to be maintained and more permanent benefit is likely to result from clean cultivation. A formula has been devised to express the persistence of parathion sprayed on coffee leaves. *Fungicides:* Standard bordeaux proved significantly superior to copper oxide and oxychloride formulations in trials for the control of *Phytophthora palmivora* on cacao. Leaf retention of copper oxychloride on coffee has risen to 75% and the incidence of rust has not exceeded 1%. *Herbicides:* The eradication of *Digitaria scalarum* in coffee areas by dalapon has led to the development of persistent stands of *Cyperus rotundus*, which has so far not responded to treatment by certain triazines, some of which were highly phytotoxic to the coffee. DNBP and simazine were the most effective weed killers in dwarf beans.

1649. COMMERCIAL GROWER.
Commercial Grower Handbook and Diary, 1961.
Benn Bros, Fleet St, London, 1960, 9 × 6 in., pp. 326 + diary, 21s.

As usual the handbook contains a wealth of information on buying plants and equipment, on growing and selling produce, and on where to obtain advice and education in horticulture.

1650. COMPAÑIA SHELL DE VENEZUELA.
Servicio Shell para el Agricultor. Resumen de Actividades 1957-58. (**Shell Service for Farmers. Summary of Activities 1957-58**), [1959], pp. 63, illus.

Brief notes are given on trials in Venezuela with vegetables, tobacco, coffee, coconuts and fruit trees. The investigations included varietal trials, fertilizer application and the control of pests, diseases and weeds.

1651. DEUTSCHER PFLANZENSCHUTZDIENST.
Jahresberichte der Pflanzenschutzämter 1958, Braunschweig. (**Annual Reports of the [West German] Plant Protection Offices 1958**), 1960, pp. 252, bibls.

A concise account of work and events in the different West German Länder [roughly counties] of interest to those concerned with the protection of plants. Nine counties, one of them being Berlin, are covered, and 18 plant protection offices. Reports are generally arranged in the same way throughout, dealing first with important phenomena and consequent action taken, then with particular investigations undertaken, next with imports and exports, and lastly with relevant publications and the staff concerned in the different operations.

1652. EAST AFRICAN AGRICULTURE AND FORESTRY RESEARCH ORGANIZATION.
Record of Research for the period 1st January to 31st December, 1959, 1960, pp. 91, Sh. 3·50.

In the soil fertility section mention is made of analyses of coffee leaves from a Zn chelate trial, in which no significant differences were found. Negative results were also obtained from analyses of chlorotic and healthy plum leaves. Work continued on the stem-pitting condition of coffee trees, and, although no causal organism has been found, a virus is suspected. Negative results are also reported from attempts to inoculate test plants and weeds with ratoon-stunting disease of sugar cane. The population fluctuations of nematodes in pyrethrum fields have been recorded.

1653. EIDG. KOMMISSION ZUM STUDIUM DER HAGELBILDUNG UND DER HAGELABWEHR. *Grossversuch III zur Bekämpfung des Hagels im Tessin. 3. Versuchsjahr Tätigkeitsbericht Nr. 12, 1959.* **(Twelfth Annual Report on the Large-scale Trials on the Prevention of Hail Storms in the Ticino (Switzerland) for 1959, 3rd year of trial III.)** [Summaries in German, Italian and English], 1960, pp. 104.

The most prominent feature or the 1959 trials was the marked dryness of the weather. Figures for the average daily amounts of rain on seeded and unseeded days were 4–8 mm. as compared with 10–20 mm. in preceding years. That the amounts for the seeded days are not appreciably different from those for the days when seeding was not done can be attributed to the fact that, when weather conditions are not conducive to the production of natural rainfall, appreciable results cannot be expected from AgI seeding. The problem remains as it was a year ago with the investigators unable to make any definite statement, negative, positive or neutral, from the results of the year's work on the effectiveness of AgI seeding for decreasing hail incidence.

1654. FAO.
Production Yearbook 1959, Vol. 13, [English, French and Spanish], Rome, 1960, pp. 484, \$5 or 25s.

1655. FAO.
Trade Yearbook 1959, Vol. 13, [English, French and Spanish], Rome, 1960, pp. 349, \$3·50 or 17s. 6d.

Horticultural products are included: there is also a section on the trade of the major non-reporting countries.

1656. FISONS FERTILIZERS LIMITED.
Levington Research Station 1960, pp. 66, illus.

Three varieties of black currant responded to straw mulching, and simazine proved the most effective weed killer. A single application of 0·1% maleic hydrazide effectively controlled runner development in Royal Sovereign strawberries without impairing vigour or reducing yield. In nutritional experiments on lettuce, cabbage, broccoli and carrots ureaformaldehyde fertilizers showed no great advantages over other sources of N; aldrin in the fertilizer controlled cabbage root fly, but experiments on carrot fly control were inconclusive. Maleic hydrazide did not prevent bolting in red beet and lettuce, but a special formulation of MH retarded growth in privet for up to 3 months. Rogor proved a satisfactory insecticide suitable for food crops.

1657. INSTITUUT VOOR TUINBOUWTECHNIEK, WAGENINGEN.
Jaarboek Tuinbouwtechniek 1960/61. **(Yearbook of Horticultural Engineering, 1960/61),** 1960, pp. 304, illus., fl. 5.

As in previous years, world literature has been examined for references to new developments in horticultural engineering, and the information obtained is grouped under glasshouse construction, heating and air conditioning, the use of electricity, tractors and implements, spraying and irrigation, harvesting, and sorting and transport. In the miscellaneous section there are reports on new apparatus for pricking out seedlings, mechanical onion harvesting and mechanical planting in nurseries.

1658. JOHN INNES HORTICULTURAL INSTITUTION.
Fiftieth Annual Report of the John Innes Horticultural Institution, 1959, Bayfordbury, 1960, pp. 50, 3s.

Plant breeding: Optimal family size and parental characteristics in top-fruit breeding; intra- and inter-specific crosses between 5 *Fragaria* species; evolution in the genus *Allium*; heterosis for yield in the tomato; resistance of tomatoes to tobacco mosaic virus; the genetics of bacterial canker in cherries; rose rootstocks. *Physiology and plant culture:* The effects of temperature and light intensity on expansion and development of the stem apex of the tomato; the effects of the physical properties of pot-plant media on tomatoes; the design of growth rooms and cabinets.

1659. LANDBOUWPROEFSTATION, SURINAME. (VAN EMDEN, J. H.)
Jaarverslag 1959, Landbouwproefstation Suriname. **(Annual Report for 1959 of the Agricultural Research Station of Surinam.)** pp. 116, illus.

Work in progress includes: *Citrus:* Manuring, shade, soil management (including weed control) and plant spacing, selection of rootstocks, pest and disease control, fruit handling (fungicidal dips). *Bananas*: Manuring, photoperiodic response, selection and propagation, *Cercospora* control, harvesting and storage. *Cacao:* Manuring, shade, plant spacing, pruning, selection, vegetative propagation (the rooting of cuttings), control of diseases and pests. *Coffee:* Manuring and selection. *Oil palms:* Selection.

1660. METCALF, R. L. (EDITOR).
Advances in Pest Control Research, Vol. III. Interscience Publishers, New York and London, 1960, 9 × 6 in., bibls., illus., £5 9s.

In addition to a number of papers on the chemical aspects of pesticides, the following are of possible interest to horticulturists: Male sterilization for the control of insects, by R. C. Bushland; Joint action in insecticides, by P. S. Hewlett; Recent developments in chemical attractants for insects, by N. Green, M. Beroza and S. A. Hall; and Absorption and translocation of regulators and compounds used to control plant diseases and insects, by J. W. Mitchell, B. C. Smale and R. L. Metcalf.

1661. MINISTRY OF AGRICULTURE, LONDON.
At the Farmer's Service.
Minist. Agric., Lond., 1960, $6\frac{1}{2} \times 4$ in., pp. 81.

This annual booklet gives concise, up-to-date information on all the Ministry's services available to farmers in England and Wales. Details are given on the advisory and educational services, on the grants, loans and subsidies which are available, on regulations concerning such matters as crop certification, export of plants, labour, pest control and marketing. Publications or addresses from which further information can be obtained are cited in each case. Finally there is a list of addresses and telephone numbers of the various local Ministry offices and Marketing Boards, and a useful index.

1662. MINISTRY OF AGRICULTURE, LONDON.
Progress Report, Experimental Husbandry Farms and Experimental Horticulture Stations, 1960, H.M.S.O., London, 1960, pp. 35, illus., 4s.

This is the first of a series of Annual Reports which will present technical information gained from work at the Farms and Stations, of value to agricultural producers. Some of the articles have been abstracted separately, and the report contains others on shelter for horticultural crops and the management of mobile houses, as well as notes on the production of high quality tomatoes, all-the-year-round chrysanthemums, runner beans under mobile glass and the technique of cucumber growing.

1663. MINISTRY OF AGRICULTURE, LONDON. DEPARTMENT OF AGRICULTURE, SCOTLAND. MINISTRY OF AGRICULTURE, NORTHERN IRELAND.
Agricultural Statistics 1958/59, H.M.S.O., London, 1960, pp. 38, 3s. 6d.

Including acreages and production figures for fruit, flowers and vegetables.

1664. NATIONAL INSTITUTE OF AGRICULTURAL ENGINEERING. (THE BRITISH SOCIETY FOR RESEARCH IN AGRICULTURAL ENGINEERING.)
Annual Report of the National Institute of Agricultural Engineering, 1958-59. pp. 86 + Suppl. 188, bibls., illus.

This year the report is much longer owing to the inclusion of reports on tests carried out on machinery and equipment. Those relevant have previously been abstracted. Departmental reports on current investigations include: *Field investigation:* Storage of undried pyrethrum flowers. *Glasshouse research:* Control of air temperature, temperature requirements of tomatoes, CO_2 concentration among tomato plants, the use of transparent plastic films for crop protection, growth cabinets and glasshouses for the control of plant environment for crop experimentation, and measurement of natural light and radiation. *Horticultural engineering:* Irrigation including automatic watering, mist propagation, vegetable washing, mechanization of bulb culture, comparisons between methods of basic tillage for vegetable crops, trials with a rotary cultivator designed for coffee plantations, spraying including machinery development and drift investigations, and hot water treatment of bulbs. *Mechanical engineering:* Hop drying, development of a small pea viner for experimental plots.

1665. NIGERIA, NORTHERN REGION.
Annual Report of the Ministry of Agriculture of the Northern Region of Nigeria, 1957-58, 1960, pp. 64, 3s.

In part VIA the work of the Research and Specialist Services Division is reviewed. Introduced varieties of sugar cane were bulked up for large scale tests. Fertilizer trials on cabbages, carrots and tomatoes indicated that the optimum rates of ammonium sulphate were 2–3 cwt. per acre for all 3 crops, and of superphosphates 3–4 cwt. for the first two crops and 6 cwt. for tomatoes. Control of eelworm with DD doubled tomato yields. Selection work continued on citrus, mangoes and kola. Some evidence was obtained that soft scale of citrus, *Coccus hesperidum*, is disseminated by the ant *Oecophylla*, and both scale and ant were controlled by a foliage spray of 1·5% dieldrin. Hand picking was effective in controlling the defoliating larvae of *Papilio demodocus*, and orchard sanitation those of *Argyroploce leucotreta*, responsible for fruit fall. Dalapon was the most promising herbicide tested.

1666. NORMAN, A. G. (EDITOR).
Advances in Agronomy, Volume 12.
Academic Press, New York, 1960, 9 × 6 in., pp. 464, bibls., illus.

Articles of indirect horticultural interest include: The clay fraction of soils, by C. I. Rich and G. W. Thomas; Fertilizers in forestry, by J. H. Stoeckeler and H. F. Arneman; and Water infiltration into soils, by J. F. Parr and A. R. Bertrand. A chapter on Agronomy in the southwest United States, by W. H. Fuller, D. F. McAlister and D. S. Metcalfe has a short section on fruit and vegetable crops.

1667. NORTH OF SCOTLAND COLLEGE OF AGRICULTURE.
Investigations, Research and Field Trials, 1960, pp. 76.

Varietal trials with small fruits, tomatoes and cabbage, trials with methan sodium as a soil fumigant and the adaptation of a flat ground mechanical thinner for use on ridges.

1668. NORTHERN RHODESIA.
Annual Report of the Department of Agriculture, Ministry of African Agriculture, for the year 1959, Lusaka, 1960, pp. 24, 2s. 6d.

Administrative report, with short references to tobacco.

1669. NYASALAND.
Annual Report of the Department of Agriculture for the year ended 31st December 1959 (Part I), 1960, pp. 34, illus., 5s. 6d.
Annual Report of the Department of Agriculture for the year 1958-59 (Part II), 1960, pp. 158, 7s.

Part I is an administrative report. Research is reported in Part II. *Tobacco:* Yield responses showed a positive interaction when P and N were applied together; topping 6 or 7 leaves instead of 5 significantly increased yield, as did increasing the number of leaves left until harvest; N applied as sulphate of ammonia had a greater effect on yield than when applied as dung; time of topping burley had no effect on the yield and quality of the leaf produced, but topped plants (flower + 3 or 6 leaves) produced higher quality leaf than untopped plants; the effects of NPK fertilizers on the percentage of "red" and "coloury" leaf and the chemical composition of these two types of leaf were examined, and the results are tabulated. *Tea:* Numerous experiments on soil moisture, pruning, shading, fertilizers and propagation are described. The condition of the bushes in relation to pruning and the method of pruning were shown to be essential factors in the responses to nitrogen and to shade; an anti-transpiration dip was of no value in increasing survival of cuttings, but heavy shade was beneficial; sphagnum moss was much better for air layering than vermiculite. *Tung:* Sulphate of ammonia was superior to tung cake applied at equivalent rates of N. *Coffee: Albizzia* and *Grevillia* shade both caused a reduction in available soil moisture but no effect of *Albizzia* on yield could be detected. *Strawberries:* Small responses were obtained to N and P in the first year, but only in the presence of adequate moisture. Variety trials and agronomic experiments with beans, pineapples, tomatoes and onions are also recorded.

1670. PLANTENZIEKTENKUNDIGE DIENST, WAGENINGEN.
Jaarboek, 1959. **(Yearbook of the Phytopathological Service, Wageningen, 1959.)**
Meded. PlZiekt. Dienst **134,** 1960, pp. 178, illus.

Diseases and pests in 1959: Most of this section is concerned with reports on occurrence and damage by plant parasites, but in the sub-section on horticultural crops some control trials are also reported: heat treatment of chrysanthemum plants (32 days at 37° C.) probably inactivated cucumis virus 1; weed control in gladiolus was best with PCP in oil; CIPC dusts and emulsions were equally effective for weed control in bulbs; the use of 3 persistent herbicides for groundsel control generally reduced bulb yields, particularly with tulips on a clay soil; infection of tulip bulbs by black leg was prevented by soil treatment with PCNB; weed control in tree seedlings was good with simazine at 1 to 3 kg./ha.; control of *Herpobasidium deformans* on *Lonicera* spp. was obtained with 0·5% copper oxychloride, 0·35% copper oxycarbonate, 0·3% zineb plus 0·5% sulphur, and 0·25% lead arsenate plus 0·09% demeton-methyl; a new herbicide (dimethyl xanthogenedisulphide) was satisfactory for weed control in spinach; weed control in carrots was best with the standard selective oils. There are also reports on the biological testing of insecticides, acaricides, slug-killers, rodenticides and materials for bird control. Two special articles on downy mildew of anemone and fungal infection of pre-packed carrots have been abstracted separately [see next number of *H.A.*].

1671. ST. VINCENT.
Annual Report on the Agricultural Department, St. Vincent, 1955, 1960, pp. 68.

Fertilizer experiments with sugar cane showed the value of early and complete N applications, a lack of response to pen manure and a large response to molasses at 2½ tons/acre.

1672. SINGAPORE.
Annual Report of the Botanic Gardens Department for 1958, 1960, pp. 25, illus., $1·50.

Including orchid breeding and culture, using media containing coconut milk and banana mash.

1673. SOCIETY OF CHEMICAL INDUSTRY.
Reports on the Progress of Applied Chemistry, 1959, Vol. 44, Soc. Chem. Ind., 14, Belgrave Square, London, S.W.1, 8½ × 6 in., pp. 705, bibls numerous.

Papers of horticultural interest include the following: Horticulture, by C. Bould, pp. 277-85, bibl. 37, dealing mainly with nutrition, root cation-exchange capacity, foliage sprays, metal chelates and glass frits; Agricultural fungicides, by A. H. M. Kirby, pp. 299–304, bibl. 43; Molluscicides, by C. A. Wright, pp. 306–11, bibl. 17; and the effect of formulation on the biological efficiency of pesticides, by E. Somers, pp. 311-26, bibl. 103.

1674. TANGANYIKA.
Annual Report of the Government Chemist, 1959, Dar es Salaam, 1960, pp. 13, 2s.

Including deficiency studies with coffee, sisal, pyrethrum and vines.

1675. TROPICAL PRODUCTS INSTITUTE.
Report of the Tropical Products Institute 1959, 1960, pp. 40, 2s. 6d.

Essential oils, spices, gums and resins: Examinations have been made of nutmeg leaves from Grenada, fevergrass oil from Antigua and the sesquiterpene constituents of the oil of *Strobilanthopsis linifolia* from Northern Rhodesia. *Oilseeds, oils and fats:* The bleaching of Nigerian palm oil was investigated. *Food and feeding stuffs, fruit and vegetable products:* Reports were made on samples of coffee, cacao, pineapple juice and slices, canned grapefruit, dates, bananas, frozen fruits, citrus pectin, bromelin and hesperidin. *Other products*: Aloes from the West Indies, reeds suitable for wood wind instruments and an agave fibre have been evaluated. *Research division:* Work has been carried out on detergents from sugar, physiologically active substances from various plants, natural insecticides of the pyrethrum type and the determination of piperine and piperettine in extracts of *Piper nigrum.*

1676. U.S. DEPARTMENT OF AGRICULTURE.
Agricultural Statistics 1958 and ***1959,*** 1959 and 1960, pp. 619 and 632, Supt. Documents, Washington 25, D.C., \$1·75 each.

1677. WEST OF SCOTLAND AGRICULTURAL COLLEGE.
Farm and Experiments 1960, pp. 84, map.

Including tomato nutrition and breeding for leaf-mould immunity; chrysanthemum, small fruit, plum and vegetable trials; weed control.

New and changed periodicals.

1678. AN FORAS TALÚNTAIS, DUBLIN.
Farm Research News. [*Fm Res. News*], 1960, Vol. 1, No.. 1, 10 × 7½ in., pp. 13, illus., 33 Merrion Rd, Dublin.

This new bi-monthly journal is published by the An Foras Talúntais organization, which maintains some 17 agricultural research stations and centres in Eire. Its purpose is to disseminate the information derived from research by means of review articles and news items. Judging from the first number the subject matter is likely to be agricultural rather than horticultural and the approach fairly popular.

1679. CARIBBEAN REGION OF THE AMERICAN SOCIETY FOR HORTICULTURAL SCIENCE (CÁSSERES, E. H., EDITOR).
Proceedings of the Caribbean Region, American Society for Horticultural Science. [*Proc. Carib. Reg. Amer. Soc. hort. Sci.*], 5th Annual Meeting, Mexico, 1957, 9 × 6 in., pp. 75, illus., obtainable from the Secretary-Treasurer, Caribbean Region—ASHS, Londres 40, O.E.E., Mexico 6, D.F., Mexico, at \$1·00 to non-members.

Many people familiar with the *Proceedings of the American Society for Horticultural Science* may be surprised to know that there is a branch covering the Caribbean (including Mexico, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama, Colombia, Cuba, Haiti, Dominican Republic, Puerto Rico and Trinidad) which also issues Proceedings. The Region was organized in 1951, and meetings have been held annually since 1955, usually in different countries. The papers published in these Proceedings are those presented during the annual meetings, and include general reports and short papers on tropical plants or of local interest, which might not ordinarily be included in the Proceedings of the parent Society. [The Proceedings of the 6th and 7th Annual Meetings have also been received and will be abstracted in the next number of *H.A.*]

1680. CREELMAN, D. W. (EDITOR).
Canadian Plant Disease Survey. [*Canad. Plant Dis. Survey*], 1960, Vol. **40**, No. 1, 10 × 8 in., pp. 47, Plant Research Institute, Research Branch, Canada Department of Agriculture, Ottawa, quarterly.

During the past 39 years the *Canadian Plant Disease Survey* appeared in the form of an annual report, which provided a very full record of the incidence of diseases occurring on many crops in different parts of Canada. Henceforth, the *Survey* is to appear as a quarterly journal with its scope widened to include preliminary research reports on disease control trials, along somewhat similar lines to those adopted by the American *Plant Disease Reporter.* In this first number there are several papers devoted to diseases of horticultural crops and their control, which have been abstracted separately.

1681. FAO.
Coconut Situation. [*Coconut Sit., FAO*], 1959, No. 1, 11 × 8½ in., pp. 28, F.A.O., Rome, single copies 2s. 6d.

This bi-annual bulletin is issued in accordance with a recommendation of the FAO Group on Coconuts and Coconut Products. Its aim is to make available statistical and economic information on a crop which has hitherto enjoyed meagre attention from this angle. One article has been abstracted separately.

1682. INSTITUTO DE EDAFOLOGÍA Y FISIOLOGÍA VEGETAL DEL CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS.
Anales de Edafología y Agrobiología [*An. Edafol. Agrobiol.*], formerly *Anales de Edafología y Fisiología Vegetal* [*An. Edafol. Fisiol. veg.*], 1960, Vol. **19**, No. 1, 9½ × 6½ in., pp. 58, Madrid.

This periodical is appearing under its new title from Vol. 19 onwards, following the creation of the Instituto Nacional de Edafología y Agrobiología. Its format and general scope remain unchanged.

1683. MINISTERO DELL'AGRICOLTURA, ITALY.
Informatore di Ortofrutticoltura. [*Inf. Ortofruttic.*], 1960, Vol. **1**, Nos. 1-16, 10 × 7 in., pp. 8 per number, illus., publ. fortnightly by Gruppo Giornalistico Edagricole, Bologna. L.600 annually or L.50 per number.

This new companion to the 3 existing Informatori (on plant pathology, animal husbandry and mobile machinery) is under the direction of Prof. Nino Breviglieri of the University of Florence. It is designed to meet the increasing need of transmitting to Italian growers, with the minimum of delay, information on the growing and marketing of fruit, nuts and vegetables collected from recent research work, which has reached the stage of practical application. The articles are mainly reviews of work carried out in Italy, other European countries and, in a few instances, the U.S.A. The standard of production and illustration is high.

1684. TEA BOARD OF KENYA.
Tea. [*Tea*], 1959, Vol. **1**, No. 1, 11 × 8 in., pp. 44, illus., Consular House, Coronation Avenue, Nairobi, Kenya.

This new quarterly magazine is well illustrated and printed on art paper. Its appeal is popular, and, judging from the first few numbers, it is addressed mainly to the planter and to commercial interests. It contains reports from tea growing districts and on market trends. It should also be a useful vehicle for the dissemination of advice on plantation management and improved methods of tea growing.